ELECTRICAL REVIEW

AN ILLUSTRATED WEEKLY JOURNAL OF SCIENTIFIC AND ELECTRICAL PROGRESS.

VOL. 34. No. 2. WEEKLY. NEW YORK, WEDNESDAY, JANUARY 11, 1899. $3 PER ANNUM. SINGLE COPIES, 10 CENTS.

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VIEWS, NEWS AND INTERVIEWS.

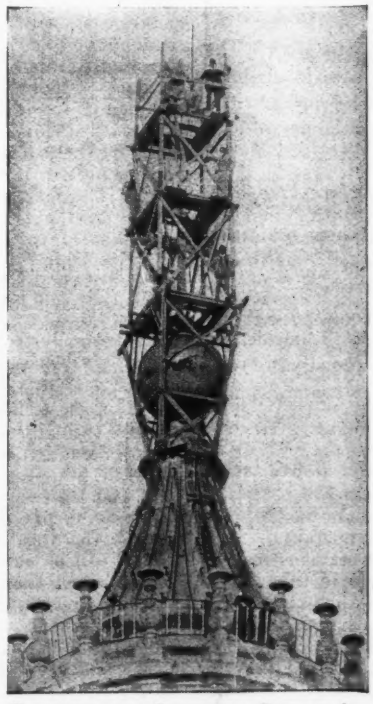
Mrs. Bloomfield Moore, of Philadelphia, died at her residence in London on January 5. For years she had been known as a financial backer of Keely, the motor man, and it is estimated that she gave him, at various times during her acquaintance with him, from $75,000 to $100,000. She took up the study of his theories, and was almost as familiar with them as he was. When Keely's death was announced, Mrs. Moore, who was ill, began to fail, and her friends believe this was largely responsible for her death. Mrs. Moore was the author of numerous papers and essays dealing with Keely's theories. About 10 years ago she endeavored to enlist the sympathies and influence of the ELECTRICAL REVIEW in aid of her friend Keely. When she failed in her attempt, she made a serious proposition to purchase the ELECTRICAL REVIEW outright, with the understanding it would thereafter advocate the Keely cult. Failing also in this, she founded a monthly magazine called the *New Science Review*, which, however, existed only for a few months. Mrs. Moore was the widow of a wealthy paper manufacturer of Philadelphia, and inherited from her husband an estate worth about $6,000,000. The closing years of her life were devoted to endeavors to enlist the sympathies and influence of scientific men in Keely's work. She was about 75 years old at the time of her death.

It is reported that Richard Croker, Jr., a son of the leader of Tammany Hall, has secured a position with the Westinghouse company.

Advices from Australia say that a new pearl-diving machine, invented and built for the New Caledonia Pearl Fishing Company, has proved a big success. It is a cylindrical chamber with conical ends. Each end is fitted with three bullseyes. The dome where the diver enters also has three bullseyes. The inside gear provides for a telephone and heating by electricity. The machine weighs a ton, and can go down 100 fathoms. It is made of steel and cost £500. It is said that the new diving-bell will revolutionize the pearl-fishing industry.

The Commercial Cable Building in Broad street, New York city, is probably as thoroughly equipped with electric elevators as any other building in the world. The installation is modern and up to date in every respect, including an auxiliary storage battery of considerable size. The elevator service from the passenger's standpoint is, however, unusually bad. It seems a pity that a system can not be put in operation in this handsome building under which the best efficiency of the elevator plant may be obtained. The elevator doors on the various floors are covered with badly printed placards, which of themselves are very unsightly. These cards inform the waiting passenger that certain elevators are express, certain others do not go beyond the tenth floor, etc. For instance, on the nineteenth floor, at the top of the building, there is a card which states that "This car does not go above the tenth floor." The absurdity of the information is apparent. The other day a visitor to the building said to one of the elevator men, "A person who can find out the proper car to get into in this building is a wonder, isn't he?" To which the elevator man replied, "That's no lie!"

The employés of the Newport News, Va., & Old Point Railway and Electric Company, formerly the Newport News, Hampton & Old Point Railway Company, were treated to an unexpected surprise early on Christmas morning by the president of the old company, Mr. J. S. Darling. The men were summoned to be at the power-house at one o'clock, and to a man they expected to receive their discharges from the new management. They were astonished to find waiting for them there checks for varying sums, the gift of Mr. Darling and his son, who sold out to the new company. The sum of $16,000 was divided among 30 employés, the amount of the checks being based on the time of service. One man received a check for $1,000; several conductors received each $750; some received $400 and $500, and the others amounts large and small. The old president, who is one of the richest men in that section of Virginia, made a speech to the men, some of whom were moved to tears by his generosity.



REPAIRING THE LIGHTNING-ROD ON ST. PETER'S, AT ROME.

The Hudson County, N. J., Grand Jury last week found indictments against the Western Union Telegraph Company as a corporation, and the company's Jersey City manager individually, for aiding and abetting green goods swindlers by knowingly permitting them to carry on their business over the company's lines. The Chief of Police of Jersey City brought the matter to the attention of the Grand Jury and suggested that a thorough investigation be made.

Repairing the Lightning-Rod on St. Peter's, at Rome.

Two years ago Father Lais, taking advantage of the repairs that were in progress on what is called the ball of St. Peter's, at Rome, that is to say, the globe, surmounted by a cross, that tops the great dome, wished, in his capacity of director of the Leonine Observatory, to make use of the scaffolding that had been erected, to examine the point of the lightning-rod. His inspection was not unnecessary, for he saw that the metallic cable was not continuous and was not connected with all the metallic masses of the building, as is considered of primary importance, with good reason, nowadays.

After having verified this in person, he gave orders to change the point of the rod, substituting for the traditional single terminal a multiple one formed like a plume. Further investigation showed that the rod ended in a hole filled with tallow and grease. This made the rod absolutely useless, and probably rendered it positively dangerous. He therefore reset the end of the rod, and, since a lubricant was thought to be necessary, he replaced the tallow by graphite, which is a good conductor of electricity. For these operations a scaffolding was erected on the top of the dome, and this is represented in the accompanying illustration.

It should be noted that this is not an enlargement of an ordinary negative, but was taken from below with a telescopic objective; it shows the possibilities of this kind of work. By this means the officers of Italian engineers have been able recently to discover, in the Alps, French batteries that had altogether escaped notice, and to observe the details of their construction.

The scaffolding presented special difficulties, and the picture shows how these were solved in a way both simple and elegant. It is formed of uprights joined by cross-pieces and resting on the metallic projections that support the ball. The complete absence of railings or parapets for the protection of the workmen will be remarked. These workmen, the men known as

the San Pietrini, are not ordinary day laborers; they have been trained for years to these difficult tasks and can give points to sailors in agility, while those under whom they work have raised practical scaffold-building to an art. They are carpenters, but they are artistic carpenters.

The bronze globe, which can hold 16 persons, is 2.25 meters (seven and one-third feet) in diameter. It is lighted by four tiny windows at an angle of 90 degrees through which tourists may observe the landscape. A legend tells that during the earthquake of February 2, 1703, two persons were in this globe. The globe swayed frightfully on account of its great height from the ground, and the persons in it were so overcome with the fear of death that, by a phenomenon that is by no means rare, they really did die, and their bodies were found in the globe. The cross above the globe is three meters (nearly 10 feet) in height, and each transverse arm is a meter (three and one-fourth feet) long. From this cross rises the lightning-rod which can be seen in the center of the scaffolding. The rod rises three meters above the top of the cross. The men standing on the scaffolding show the height of its different parts and give an idea of the size of the pieces of wood used in its construction.

The above particulars are taken from a translation in the *Literary Digest* of an article which appeared recently in *Cosmos*, of Paris.

A New Alternate Current Wattmeter

The Behn-Eschenburg wattmeter is on the principle of the d'Arsonval galvanometer, the fixed magnet being energized by the main current, and the moving coil taking current from a shunt across the mains. The axis of the moving coil is perpendicular to the plane of the horseshoe fixed magnet. The shunt consists of an inductionless resistance, one end joined to one main, the other to two resistances in parallel; of these, one is inductionless and completes the circuit directly to the other main, and the other is inductive and completes the shunt circuit through the moving coil. The object of the small inductive resistance inserted in series with the moving coil is to balance the effect of the hysteresis in the main circuit. The latter produces a phase difference of about five degrees, and by suitably adjusting the inductance of the shunt circuit, according to calculations given in the paper, a similar phase difference is created in the shunt circuit and the effect of hysteresis balanced at any frequency.

HIGH-VOLTAGE POWER TRANSMISSION.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, OMAHA, JUNE 30, 1898, BY CHAS. F. SCOTT.

(Continued from page 3.)

The highest voltage which is used for transmission is in the Provo plant of the Telluride Power Transmission Company in Utah, which transmits power 35 miles to the Mercur Mills at 40,000 volts. Raising transformers are three in number and are connected in the star form. Each transformer has a capacity of 250 kilowatts. The middle points of both the high-tension and low-tension circuits are grounded. In general design these transformers resemble the transformers used in the high-tension tests at Telluride; the design and construction having been under the direction of the same man in both cases The line extends from Provo at an elevation of 4,500 feet to Mercur, at 2,000 feet above Provo, and the line reaches an extreme height of about 10,000 feet above the sea level. Three miles of the line are strictly mountain construction. The lightning protection is afforded by choke-coils and Wurtz non-arcing metal arresters. The insulators are of glass. The design was based on the tests at Telluride and they were made especially for this plant. The insulators are held on special pins of oak which are thoroughly paraffined. The lower part of the insulator is five inches above the cross-arm.

In dry weather there has been no difficulty whatever in operating. The insulators do their work as effectively as could be expected if the voltage were only a few thousand volts. When everything is dry, the line will operate without difficulty, even if some of the insulators are off and the wire rests upon the cross arm. When it rains there is sometimes trouble. It is indicated in the station by the ammeters giving quick swings, showing momentarily strong currents. Sometimes this is apparently a short-circuit and blows a fuse. In every case where there has been trouble on the line it has been in rainy weather, and broken insulators have been found which located the trouble. It is certain that in most cases these have been previously broken by bullets, and in other cases it is probable that the insulators were likewise broken. It is believed, therefore, that had there been no intentional breakage of insulators, there would have been no trouble upon the line since the plant began operating in February last. A few of the insulators near the station are not far from the overflow. and are in a moisture equivalent to a rain all the time, without doing any damage. Snow has often backed from the cross-arm up against the bottom of the insulator and around the first petticoat. It is usually found that the part of the insulator around and near the wire does not receive deposits of moisture or frost but remains dry, the particles being repelled. At this plant, current for about 700 horse-power is carried through three fuses of copper wire 0.01 inch in diameter. Iron wire is used on a branch line for transmitting about 100-horse-power for about three miles.

This plant has been in operation in Winter and in Summer, "in thunder, lightning or in rain," the sole supply of power for the enormous De Lamar mines and mills at Mercur, and is a happy and fitting consummation of the high-tension tests described in the beginning of this paper.

Limitations of High-Voltage Transmission—The important commercial question is: To what distance can power be transmitted? The relation between distance and voltage is well known. The same weight of copper can transmit with equal efficiency the same power to any distance, provided the voltage is increased directly as the distance is increased. The limiting commercial ratio between voltage and distance is easily found. If the distance be three miles per 1,000 volts and the loss 16 per cent, the cost of copper is about $20 per horse-power. The interest on the latter investment is about $1 per year. A distance in miles equal to three times the number of thousand volts may therefore be covered without an excessive annual charge per horse-power for copper. The limits to the voltage which are practicable depend principally upon the insulator and upon the loss between wires.

The Insulator—The two fundamental requirements are dielectric strength sufficient to prevent puncture, and a size and form which will prevent the passage of the current around the insulator. A given insulator will be adequate for a higher voltage, where the atmosphere is comparatively pure and dry, than it will be under other conditions. The rapid progress which has been made in the design and construction of insulators during the last few years, will doubtless provide an insulator which will accommodate the highest voltages that can be used due to other limitations. The insulator, therefore, while remaining the critical point in a transmission system will probably not determine the limit of practicable voltages.

Loss Between Wires—The loss between bare wires at high voltages seems to determine a positive limit, beyond which the voltage can not be increased. This loss is subject to variation due to diameter of wire, distance between wires, and wave form of the electro-motive force, but the variations which may occur under favorable commercial conditions locate the point of increase of loss about 50,000 or 60,000 volts. Under favorable conditions this may be raised somewhat, but it is not probable that any material increase can be made.

Amount of Power—The amount of power to be transmitted involves some interesting commercial limits. There are certain elements in a transmission which do not vary greatly with the amount of power transmitted. Thus, the charging current to the line will be practically the same whether the wire will transmit 1,000 horse-power or 100 horse-power. If the charging current happens to represent 300 horse-power it would be insignificant in one case, but for the smaller output it would require generating apparatus several times that necessary for the actual power.

It is not mechanically practicable to use wires as small as would be sufficient, in so far as conductivity is concerned, for transmitting a small power.

For example, a No. 7 copper wire, which is as small as is ordinarily used, if employed in a three-phase circuit 50 miles in length, will transmit over 1,000 kilowatts at 40,000 volts with 10 per cent loss. If only a few hundred kilowatts were to be transmitted, the cost per kilowatt would be excessively high, and on the other hand a lower voltage could be used without undue loss. In some cases, indeed, where a high voltage is used for small power, as, for example, on a branch circuit, an iron telegraph wire would have ample conductivity. In other cases an aluminum wire could be used to advantage, as an aluminum wire of the same conductivity as a copper wire has only about half the weight, and possesses greater mechanical strength in comparison to its weight.

It may also be noted that high-voltage transformers can not be economically built for small output, as the insulation spaces required are so large. The cross-section of the copper is often not more than 10 or 20 per cent of the area of the opening in the iron. The cost per kilowatt increases very rapidly when the size of transformer falls under a few hundred kilowatts.

Cables and Conduits—The overhead transmission line has been considered, and its limitations are the insulating strength of the insulator and the losses through the intervening medium. In a cable or a conduit the insulation must be provided continuously instead of at points 100 feet apart. Rubber-covered cables are made for 10,000 and 20,000 volts, but it is quite possible that it will not be commercially practicable to make cables for much higher voltages. The effect of continued electric stresses on the insulation of the cable, which is an unknown factor, may prove to be a very important one. A conduit composed of a pipe containing oil, in which the wires are separated by glass tubes, has been proposed. Many mechanical difficulties arise in constructions of this kind; the cost is high and the action of continued high voltages on solids and liquids opens a field which is little known. A suitable insulation on the wires on high-voltage lines may enable higher voltages to be used than can be used with a bare wire.

Liquid air with its high insulating properties and the low temperature and consequent high conductivity which it would give to a conducting wire may enable us to use air insulation in a new way.

Difficulties and Precautions—High voltages have been referred to in this paper with perhaps undue familiarity. Familiarity with high voltages is not one which breeds contempt. A voltage which can produce sparks several inches in length, which can be felt through several feet of air, which causes hissing sounds, which produces luminosity and which in a confined room generates strong odors of ozone, is one which creates profound respect. Dangers and difficulties accompany it, and the highest intelligence, vigilance and excellence must be employed to avoid accident and insure success. While ordinary types of construction do not seem to reach their limitations until some 50,000 volts is reached and pressures of this order have been and are in regular use, nevertheless they are not to be used indiscriminately or where they can be avoided. There are difficulties enough in handling 15,000 and 20,000 volts. As the pressure is raised the liabilities to trouble increase at an alarming rate. It is, however, a fact that these voltages have been and can be used, and also that no new or modified methods of transmission will be required before 50,000 or 60,000 volts can be employed for distances up to 150 or 200 miles.

Appendix A — Instruments and Methods Used in Telluride Measurements. [Extract from report of Mr. Mershon.]

"The Wattmeters—At first, all the measurements of power were made in the low-tension circuit. The attempts to measure the power delivered to the line by taking the difference in the readings of the wattmeter in the low-tension circuit of the transformers when the lines were on and when they were off proved worse than useless. This was due to the fact that throwing on the lines distorted the electro-motive-force wave impressed on the transformer. As a result, at low voltages, readings obtained in this way indicated a negative line loss, and it was only when the voltage was raised to such a point that the line loss was greater than the reduction in iron loss, due to the electro-motive force distortion, that positive results could be obtained; such results were, of course, incorrect. In order to overcome this, it was determined to balance on the wattmeter the effects of the iron loss in one of the power transformers against that of the other in such a manner that both transformers would be subject to the same electro-motive force distortion, and the iron loss would therefore at no time register anything on the wattmeter. The line loss could then be measured directly. This was accomplished as is shown in Fig. 18.

"Here the transformer which supplies the line is designated as the 'power transformer,' while that which is used in balancing the iron loss of the power transformer is called the 'balancing transformer.' As was stated in the description of the transformers, the power transformer has four of its low-tension coils in multiple for receiving power, while the fifth or middle low-tension coil is independently used in connection with the measuring instruments. This middle coil of each transformer is shown in the sketch, and it is through these coils that the balancing transformer receives its voltage. That is, one-third of the middle coil of the power

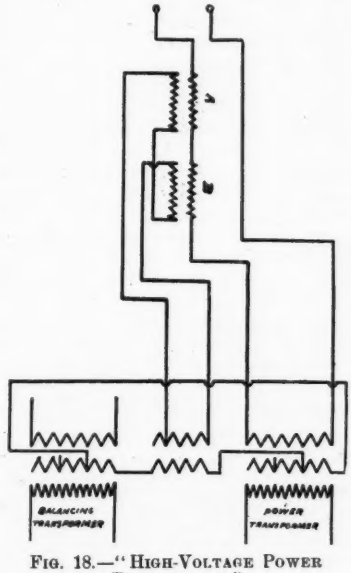


FIG. 18.—"HIGH-VOLTAGE POWER TRANSMISSION."

transformer feeds one-third of the middle coil of the balancing transformer. With such an arrangement the balancing transformer receives practically the same wave form as that impressed upon the balancing transformer, no matter what the amount of wave form distortion may be. A is the field-coil of the wattmeter. It has two windings. Through one of them, the primary winding, passes the current to the power transformer; through the other, the secondary winding, passes the balancing current—the current to the balancing transformer. As these currents are in opposite directions in their respective windings, when adjusted to the proper values, their effects on the shunt coil of the wattmeter annul each other. It is evident that if A only were used, a balance for iron loss when the lines were off would not necessarily mean a balance when the lines were on, because the change in current due to putting the lines on would cause a change in the reactance electro-motive force of the secondary of the wattmeter field coil, and consequently a change in the balancing current through this secondary. The air transformer B is therefore used; B is preferably, but not necessarily, exactly similar to the field coil A, and supplies an electro-motive force in its secondary exactly equal to and in step with that of the secondary of A. These two secondaries are connected in series, so that their electro-motive forces oppose, and through them both is sent the balancing current. The secondaries of A and B are not connected directly in series with the circuit connecting the middle coils of the power transformer and balancing transformer, but are included in this circuit through the medium of a series transformer C. C makes possible the adjustment of the balancing current to the value necessary for zero wattmeter reading when the lines are off, and it, or some equivalent device, is necessary because of the impossibility of securing two transformers with exactly the same iron loss. Indeed, in this particular case the ratio of the hysteresis to the Foucault current loss differed sufficiently in the two transformers to necessitate adding in shunt to one of them an ohmic resistance which made up for the lack of Foucault current loss in it. This method of reading power is, if properly carried out, a most admirable one, and has the advantage that the instruments to be handled are all in the low-tension circuit. The balance may be obtained without difficulty, and when once properly obtained holds through all ranges of voltages and distortions of wave form. Tests of this balance were made repeatedly with the lines off, by varying the impressed electro-motive force through wide ranges and distorting the electro-motive force wave, the distortion being produced by introducing in series with the power transformer large amounts of both resistance and reactance. In every case the balance was perfectly preserved. There is one drawback, though not a serious one, to the method as here employed. The power transformer, because of the load upon it, heats up faster than the balancing transformer, and the balance is in consequence impaired. The amount of unbalancing is, however, small, even for wide difference of temperature, and it can be easily corrected for by means of zero readings taken before and after a set of observations. This unbalancing, due to unequal heating, could be rendered negligible by placing the power transformer and the balancing transformer in the same tank of oil.

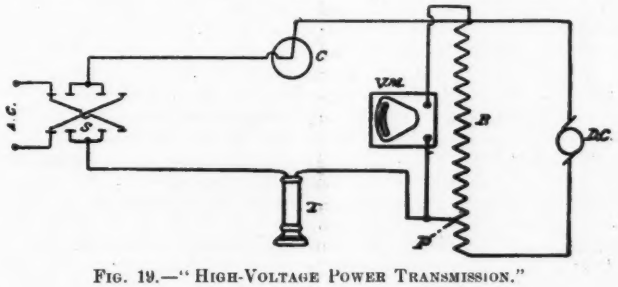


FIG. 19.—"HIGH-VOLTAGE POWER TRANSMISSION."

"Although in this case the balancing transformer was of the same size as the power transformer, it may be much smaller, though both transformers should be worked at the same induction. Of course it is not necessary that the balancing transformer have a full set of windings. It need only have a coil suitable for receiving electro-motive force impressed upon it.

"The wattmeter actually used in this work consists of a field-coil so mounted that a Weston wattmeter can be slid in and out of it, and different ranges thus obtained. The scale originally on the wattmeter was replaced by one of equal parts. The wattmeter's own field coil is not used at all, the field being supplied wholly by the large external field bobbin. The voltage impressed upon the wattmeter shunt-coil was at first obtained from the auto-transformer above mentioned, but later it was obtained directly from one-third of the middle coil of the power transformer by the use of an additional resistance or multiplier. The winding of the field bobbin consists of 27 turns of a cable composed of seven No. 8 double cotton-covered magnet wires which were twisted together after having been separately treated with 'P. & B.' insulating compound.

"The wires are brought out separately to terminals on the top of the bobbin, and can be used singly or in any desired series or multiple combination. They were, for this work, connected up into two sets, forming the primary and secondary of the wattmeter coil. The size of this field-coil, necessitated by the size of the wattmeter box, gives it a large reactance, and as this has added to it the equal reactance of the air transformer, the reactance of the combination is considerable. This is objectionable, because of the consequent distortion of the generator electro-motive-force wave, for though the results obtained under these conditions are accurate, they are in some cases the results of conditions differing widely from those which will ordinarily be met with in practice. The combined reactance of the field-coil and the air transformer at a frequency of 60, when passing a current taken by a power transformer supplying the line, is 2.83. The current used in obtaining this figure probably differed somewhat from a sine wave. If the wattmeter were specially constructed with a view to this work, the movement being surrounded as closely as possible by the protecting case, the external field coil into which the movement projected could be made small enough to reduce the reactance to a negligible quality. In designing a wattmeter for this work, it should be borne in mind that it must measure under the condition of a very small power factor.

(To be concluded.)

SUBMARINE TELEGRAPH CABLES IN TIME OF WAR.

BY COMMANDER C. H. STOCKTON, U. S. N., IN THE "JOURNAL OF THE UNITED STATES NAVAL INSTITUTE."

Though the recent hostilities with Spain were so short in duration, and so restricted as to opportunities for the settlement of important questions of war and international law, there was, nevertheless, one matter which assumed an importance throughout the entire period, and that was the question of international telegraphic communication by means of submarine cables in time of war.

From the time of the cutting of the Manila cable by Admiral Dewey, until the removal of the censorship of the communication by cable between Havana and Europe, it was a matter always under consideration by the belligerents, and far from being ignored by the neutrals concerned.

It was, of course, not entirely a novel question in the works and discussions upon international law, but it was a question which, though meager as to usage, is constantly extending in its geographical area in the world as well as increasing in importance, both for peaceful and war like purposes.

The general question of the international protection of submarine telegraph cables on the high seas and elsewhere led, in the past, to various general conferences upon the subject in Europe; the last one being held in Paris, at which was concluded a convention on March 14, 1884, the ratifications of the signatory powers being exchanged on April 1, 1885, and the date arranged for the agreement or convention to go into effect was May 1, 1888. To this convention the United States was a party, the Hon. L. P. Morton being our representative. The convention treated of the laying and protection of telegraphic cables in time of peace, Article XV of the convention reading as follows:

"It is understood that the stipulations of this convention shall in no wise affect the liberty of action of belligerents."

Concerning this article, Dr. Macdonell, an English lawyer of recognized standing, in a recent lecture, says:

"The fifteenth article of the Submarine Cable convention expressly reserves the rights of belligerents, which, I take it, include cutting or injuring any cable likely to be useful to an adversary, however injurious such interruption may be to neutrals. This is confirmed by referring to the *procés verbal* of the proceedings. I find that the Belgian delegate, M. Orban, stated that, 'as he read the article, the text recognized the liberty of action of the belligerent, and, by implication, his right to cut submarine cables, even those that land on neutral soil.' Another representative at the conference gave formal intimation, at an early stage in the proceedings, that the convention for the protection of submarine cables should have no application except in time of peace. At the time of signing the convention, Lord Lyons presented a declaration in the name of the English Government to the following effect: 'Her Majesty's Government understand by Article XV that, in time of war, a belligerent power which has signed the convention will be as free to act in regard to submarine cables as if the convention did not exist.' M. Orban, the Belgian delegate, added a declaration to the same effect: 'The Belgian Government, by the medium of its delegates at the conference, has maintained that the convention had no effect on the rights of belligerent powers; these rights would be neither more nor less extensive after the signing of the convention than before.'

"There is little doubt that it was the opinion of the signatories of the convention of 1884 that a belligerent might freely cut submarine cables—might, for example, sever the connection between England and her colonies and foreign possessions without just cause of offense."

So far as the usage is concerned, up to the time of our war with Spain, it is confined, as far as I can ascertain, to the Franco-German War, the war between Chile and Peru and the civil war in Chile. In these cases cables were cut both within the territorial waters of the belligerents and in exterritorial waters or the high seas. The belligerent action of the late war in cable-cutting, which was wholly upon our part, did not limit the cutting, or the attempts to interrupt the communication, either to the territory or to the property of the belligerent concerned.

There can be little doubt as to the right of a belligerent to cut, destroy or interfere with a submarine telegraph cable or terminal station, no matter by whom owned, in the territory, land or water of the enemy, whenever military necessity or convenience requires it. The belligerent concerned is the sole judge of this necessity and of the nature of the interference which he proposes to create. Such an act is, of course, a belligerent act, and neutrals participate in it at their risk, as when they enlist in a belligerent's army or navy.

It is generally recognized, certainly by the United States, that under certain circumstances and conditions, materials for the construction of telegraphs are contraband of war. Submarine cables, if found ashore in belligerent territory, or afloat, bound for a belligerent destination, as an enemy's port or fleet, would certainly be liable to seizure as material for the construction of a telegraphic communication, and hence contraband of war. If it then can be considered contraband of war on its way to a hostile destination on the high seas, as material or a component part only of a working telegraph, how much more does such a cable become contraband of war when it is in working order, actually conveying aid, information and, possibly, money to a belligerent or belligerent country in time of war.

Much could be and has been said about the commercial importance and general usefulness and harmlessness of telegraphic communication by cable to neutrals and to innocent persons of both belligerents in war time, but such usefulness must give way to the stern necessities of war. War, as our late hostilites prove, is not a benevolent measure, nor can it be successfully used as a means of immediately conveying benevolence or charity. That, ultimately, it may become of service in that direction there is, I think, but little doubt; but during the active operations, convenience and commerce must, when necessary, step aside. There is no doubt also, to take an instance, of the convenience and utility and even humanity of a system of buoyage and lights ashore and afloat for the purposes of navigation and safety; yet, in times of war, the extinction of seacoast and harbor lights and the removal of buoys is directed by belligerents and submitted to by neutrals without question as matters of military necessity and right.

Besides the contraband character of the material of a telegraphic cable in use or en route, as an essential element of belligerent communication which renders it liable to seizure anywhere out of neutral territory, there is another phase of this question, and that is in regard to the nature of the service afforded by such a communication by a neutral proprietor to a belligerent.

This service is in the nature of both an evasion of a blockade and, what has been termed of late years, of unneutral service. It does not matter in this phase whether the cable be privately or state owned, so far as the technical offense is concerned, though the gravity and consequences are naturally much more serious in the latter case. Let us take, as an instance, the case of a blockaded or besieged port, as Havana and Santiago were during the late hostilities. The communication of information, or of dispatches, or of means of assistance which can be made by such means, is an unneutral service, and would resemble also the violation of a blockade by a neutral vessel carrying dispatches, the capture of which upon the high seas outside of territorial jurisdiction would be a justifiable and indisputable act of war.

Extend this to a country or port not blockaded or besieged, and you would yet find the cable, owned, let us presume, by a neutral, the means of performing the most unneutral kind of service, of a nature which, done by a ship, would most properly cause its seizure, condemnation or destruction by the offended belligerent.

There are, however, other conditions existing besides that of a cable leading by way of, or from, a neutral country to that of a belligerent. Such is the case of a cable laid between two neutral ports, link of a chain, perhaps, reaching from a belligerent to his colony or foreign possessions. In this case there is little doubt but that the cable should be exempt from seizure or attack—the transit of continuous hostile or belligerent messages is too slight a matter compared with the gravity of interruption to allow such a cable to be tampered with. The Institute of International Law, in a session held in 1878, adopted the conclusion or declaration of opinion "that any submarine telegraphic cable that united two neutral territories should be held inviolable." This will doubtless be firmly established in time to come as a sound rule, as is both reasonable and proper.

If, however, there should be a neutral station or landing place interposed between the termini of a cable, both termini being on territory of the same belligerent, the safety and use of the cable could, perhaps, be assured by a censorship on the part of the neutral as to messages. A belligerent to whom such a cable is of essential military importance should provide for this contingency by laying a cable or loop outside of the neutral territory, if the entire distance is not beyond the telegraphic range of the instruments. At all events, one belligerent is not unreasonable in demanding that the neutral should not permit messages from the other belligerent passing through neutral territory, of a nature injurious or disadvantageous to himself. It is not unlike the transit of troops through neutral territory; even if such be granted alike to both parties, it may still work injuriously to one of them. If, however, neither belligerent offered objection, or if mutual consent was definitely given, permission to use the cable indiscriminately by both belligerents could be properly allowed by the neutral country or by the neutral cable company.

When possible, cable communication generally should, of course, be kept open for commercial or other innocent intercourse, and in many cases a government censorship can meet the circumstances and requirements of the war and prevent injury to a belligerent. It is gratifying to know that to this solution of the question the practice of the United States in the late war greatly contributed.

In conclusion it may be interesting to state the circumstances at Manila, after the action of May 1:

The cable from Manila to Hong Kong was owned and controlled by an association of English and Danish companies and subsidized by the Spanish Government. After the battle of Manila Bay, Admiral Dewey asked for its use and agreed to its use also by the Spanish if he could send his dispatches. This the Governor-General of the Philippines refused, and hence Admiral Dewey cut the cable. The cable company refused to send Admiral Dewey's dispatches through Hong Kong, notwithstanding his offer to pick up the

cable and provide the instrument for its use in Manila Bay.

In this case the right to cut the cable was undoubted. The common use of the cable by both Admiral Dewey and the Governor-General, if agreed upon by both parties, would have placed the cable in a neutral position—both parties agreeing. The use of the cable by Admiral Dewey alone, or by the Spanish alone, would have placed the cable company in the position of aiding one side at the possible expense of the other. The use of the cable at Hong Kong station was, in all probability, common to both sides, and without objection from either belligerent. The fact that the cable was subsidized by the Spanish Government made it more than ever a belligerent instrumentality, subject to seizure or disabling by the other belligerent, but doubtless also made the cable company feel that it would be especially unwise to lend aid against subsidizing power.

Authorities—Dr. Macdonnel, journal Royal United Service Institute, No. 246, page 916; Perels, "Manuel de Droit Maritime International," pages 75, 77, 217; Fiore, "Nouveau Droit Inter. Public," page 22; Owens's "Declaration of War," pages 182, 382; "Manual of International Law," Ferguson, sections 123, 124; "Treaties and Conventions of the United States," 1776 to 1887, pages 1176, 1187.

More About Long Spans of Telephone Wire.

To the Editor of Electrical Review:

In the Review of December 21 Manager Lerch says that the Pennsylvania Telephone Company lately put up the largest span of wire that is strung in Pennsylvania, or possibly in the United States, it being over 1,600 feet long, spanning the Delaware River. I am pleased to say that a few years ago I had the great pleasure of taking down for this company (Iowa Telephone Company) a span over the Mississippi River at this point which was over 2,000 feet long.

Truly yours,
S. T. Huebule,
Manager Iowa Telephone Company.
Burlington, Iowa, Dec. 30, 1898.

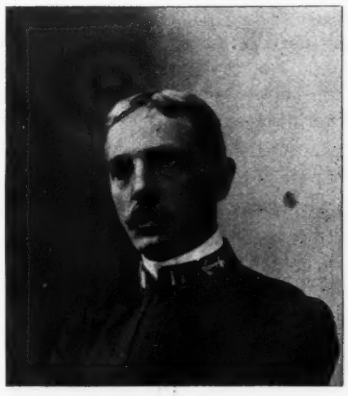
LITERARY.

The subject of "The United States at the Paris Exposition in 1900" is dealt with by Ferdinand W. Peck, Commissioner-General for the United States to the Paris Exposition of 1900, in the January number of the *North American Review*. By their efforts to surpass each other in the magnificence of their displays, foreign countries will doubtless render the forthcoming exposition the greatest of its kind, and it is expected that the United States will have some new invention or device so especially attractive that the American section will prove the *clou* of the entire exhibit.

Thomas C. Wood.

Mr. Thomas C. Wood, president of the Ball & Wood Company, of New York city, was born in Utica, N. Y., in 1850. In 1866 he received an appointment at the Naval Academy at Annapolis from the Hon. Roscoe Conkling. Having been graduated in 1871 as a midshipman, he served for the next two years aboard the "Wabash," and in May, 1874, after passing his examination for promotion to the grade of ensign, he was ordered to the "Plymouth" for service in the West Indies. While on this ship he served a part of the time as a watch officer, and took part in the expedition sent up the Rio Grande to cooperate with the army in the suppression of cattle raiding from Texas into Mexico.

In 1876 Mr. Wood resigned from the navy to engage in business, and



Lieut. Thomas C. Wood, U. S. N.

formed a partnership, under the title of Skinner & Wood, to build portable and stationary engines in Erie, Pa. The business experienced a rapid growth, and in 1885 Mr. Wood retired, disposing of his interest to his partners. After spending two years in European travel with his family, he returned to New York city in 1888 and established with Mr. Vincent the firm of C. R. Vincent & Company, contracting engineers. In 1891 this business was absorbed by the Ball & Wood Company, builders of steam engines largely for electrical work. Mr. Wood is president of the company, which has offices at 120 Liberty street, New York city, and a manufacturing plant at Elizabeth, N. J.

After the "Maine" disaster, when indications pointed to a war with Spain, Mr. Wood offered his services to the Navy Department, and in May, 1898, received his commission as lieutenant (senior grade), the rank then held by his old class. He was ordered to the "Gloucester," under Lieutenant-Commander Wainwright, and served on her throughout the Spanish War. Lieutenant Wood took part in all the operations of the fleet on the southern coast of Cuba, including the bombardments at Guantanamo and Aguadores, and the famous battle of July 3 with Cervera's fleet off Santiago. As naval aide, Lieutenant Wood had the honor of attending the ceremonies at the surrender of Santiago. The "Gloucester" was afterwards ordered to accompany the Porto Rican expedition under General Miles, and Lieutenant Wood commanded the first landing parties at Guanica and Arroyo, made in advance of the army operations. While engaged in this service he performed gallant duty in holding against attacks of the enemy and, with a small force, one of the captured towns. The "Gloucester" was at Arroyo when hostilities were concluded, and when she arrived in the United States, in September, Mr. Wood received his honorable discharge and resumed his business connections with the Ball & Wood Company.

In a recent conversation with Lieutenant - Commander Wainright, a representative of the Electrical Review was told by Mr. Wainright that, in his opinion, Lieutenant Wood was one of the best and most gallant officers who served in the navy during the war. Lieutenant - Commander Wainright was high in his praise of Lieutenant Wood for his action in saving life at great personal peril when the ships of Cervera's fleet were ashore and burning on the beach near Santiago. It was largely due to Lieutenant Wood's efforts that the lives of so many Spanish sailors were saved at that time.

SCIENCE ABSTRACTS.

Contact Electricity of Metals. Kelvin—The first part of this paper is historical. Volta's fundamental experiments and others are described and deductions drawn from them. The author's own researches upon the measurement of contact force, and those of Pellat, Pfaff, Bottomley and Erskine-Murray are referred to. The author then discusses thermo-electric electro-motive force. If a closed circuit consisting of, say, copper and iron is broken at one of the junctions, and a quadrant electrometer inserted, the deflection will be a measure of the contact force plus the thermo-electric electro motive force due to any difference of temperature between the junctions. If a copper plate is allowed to move inwards in the gap, moving on the copper part of the circuit (which is supposed to be of large cross-section), cold will be produced at the other junction; if it is drawn out heat will be evolved, but such heat is not the thermal equivalent of the work done; probably the greater part of the work done in drawing out the plate against the electric attraction goes to storing up electro-static energy. Reasons are then given in support of the view that the Peltier evolution of heat is not the thermal equivalent of electromotive force at a junction. Volta's experiments render it certain that two metallically connected pieces of metal attract one another, the force of attraction being a resultant of chemical affinity between thin surface layers of the two metals. The work done by electric attraction in allowing two such plates of copper and zinc to approach each other is calculated for various distances ranging from 1/100 centimeter to $1/10^{10}$ centimeter. The value of the force, heat evolved, and rise in temperature are also given. It is inferred that the attraction does not vary inversely as the square of the distance for such small distances as $1/10^{9}$ centimeter, because the value of the force then becomes so large as to be inadmissible; at smaller distances the electric attraction merges into molecular force between the metals. Suppose a disk of zinc to be metallically connected with a disk of copper at some distance from it, then disconnected and brought near to the copper; no work is done in this movement by the electric attraction. If connection is now made, current flows and heat is generated. Imagine a pile of alternate disks made up in this way, and finally metallic connection made between all the disks. If the disks are thin, and the distances between them are suitably small, sufficient heat will be generated to give a column of brass. This would take place if we suppose the electric attraction to vary inversely as the distance for disks 10^{-8} centimeters thick at a distance of 10^{-9} centimeters apart, and the resulting heat would be much the same as the heat of formation of brass experimentally determined. The author concludes with an argument against Lodge's chemical theory of contact force and with experiments on uranium rays.

Commutation in Dynamos. P. Girault—This is an elaborate calculation on the effect of irregularities of either field-magnets or armature on sparking in dynamos. It is shown that small interpolar spaces are disadvantageous on account of the variations of the flux due to that armature-coil which is under commutation. The author thinks that carbon brushes are always more conducive to sparkless commutation than gage brushes. He is also of opinion that it is possible to make machines in which there will be reversal of current at the forward polar horns, and which will run sparklessly on account of the dragging of the armature flux by the armature itself for the coils under commutation, by employing a large neutral zone, sufficiently subdividing the armature, and using brushes whose resistances vary progressively.

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]

TIMES BUILDING, 41 PARK ROW,
P. O. BOX 2339. NEW YORK.

NEW YORK, JANUARY 11, 1899.

CHARLES W. PRICE, - - - - - - EDITOR.
STEPHEN L. COLES, - - ASSOCIATE EDITOR.
STEPHEN H. GODDARD, ADVERTISING MANAGER.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," - - - NEW YORK.

TELEPHONE CALL, 1546 "CORTLANDT."

NEW YORK OFFICE:
RUSSELL HOWLAND, REPRESENTATIVE,
Times Building, 41 Park Row.

WESTERN OFFICE:
FRANK E. COLBERT, REPRESENTATIVE,
960-965 Old Colony Building, Chicago.

WASHINGTON OFFICE:
GEO. C. MAYNARD, - REPRESENTATIVE,
800 H Street, N. W., WASHINGTON, D. C.

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News, Subscriptions and Advertisements.

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CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

Subscription to the ELECTRICAL REVIEW.

One Year, United States and Canada, - - $3.00
One Year, Foreign Countries, - - - - 5.00
Single Copies, - - - - - - - - - .10
Copies can only be supplied for one year back at 25 cents each.

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An electric railway, to run successfully through a heavy snowstorm, needs, first of all, two things—a good weather guesser and plenty of snowplows.

The industrial outlook in the United States, particularly in the electrical field, was never so encouraging as now. One of the greatest, if not the greatest, years in industrial history will be 1899.

DAMAGES FOR CABLES CUT IN TIME OF WAR.

An interesting phase of the war has recently developed. Certain electric cable companies are presenting claims to the government for loss of business due to interruptions by the War Department. The companies believe they have a precedent for their action in the case of the Central and South American Telegraph Company, whose cables were cut during the disturbances resulting in the overthrow by the Congressional party of the Balmaceda government in Chile. The Central and South American case against the government was prosecuted by Mr. Blaine, who succeeded in getting a judgment for $48,000, about one-fourth of the amount claimed.

The principal argument against the allowance of such a claim is that the pending cases are not parallel with the South American case. In the case of the cable companies at Manila, it is cited that they were being used as a weapon of war against this government.

There are many features of the case not here touched upon, and it is already apparent that the government should weigh well any action taken, as this government may, in the near future, own cable properties of its own, and should avoid establishing an undesirable precedent.

The ELECTRICAL REVIEW estimates that $2,000,000 worth of electric storage batteries were sold during 1898, and predicts that $8,000,000 worth will be sold during 1899. This advisedly.

The ELECTRICAL REVIEW publishes in this issue, by special permission of the United States Naval Institute, an interesting and authoritative paper on "Submarine Telegraph Cables in Time of War," by Commander C. H. Stockton, U. S. N.

A former British naval officer, now in Australia, is reported to have invented a new type of submarine boat, the motive power of which is electricity. While many naval experts still maintain doubts as to the efficiency and safety of submarine craft, there is little doubt that electricity is the most satisfactory power for their propulsion.

It is a pleasure to commend a daily newspaper for a correct description of a technical subject. The article on underground conduits, which appeared in the Sunday edition of the New York *Sun* for January 1, was a good story, correctly and entertainingly written.

The ELECTRICAL REVIEW has received so many words of congratulation on the work it accomplished during 1898, and such a multitude of expressions of good-will for the future, that it would be almost impossible for us to reply individually to all of our well-wishers. Therefore we take this means of acknowledging these evidences of good-will, and trust we may be able to live up to the ideals set for us by our friends.

We are pleased to learn that Governor Roosevelt is considering the name of Col. John N. Partridge, of Brooklyn, for the position of State Superintendent of Public Works. No better appointment could be made. Colonel Partridge is a man of the highest integrity, has been accustomed to handling extensive businesses and controlling large forces of men, and is a veteran officer of the Civil War. If this selection is made, the people of New York can rest assured that the State's best interests will be carefully guarded in the department presided over by Colonel Partridge.

It has been announced that a considerable number of automobile vehicles, operated by compressed air, will soon be in service on the streets of New York city as delivery wagons. It seems to us the splendid record already made by the electric cabs in New York, in spite of all kinds of weather, should leave little to be desired by the progressive business man who wishes to abandon the horse in favor of self-propelled conveyances. The inducement offered by the manufacturers of the compressed air vehicles must be of a very persuasive character. We suggest, in a purely friendly spirit, that each compressed-air vehicle be supplied with a captive balloon, so that when the thing explodes the occupant of the vehicle may have some sort of a chance of getting back to earth without too much suddenness.

ELECTRIC ORE STAMPS.

Every now and then a patent is issued for some form of electro-magnetic ore stamp, but none of them seems to get into use commercially. The great bulk of the numerous mills in the gold districts are to-day made up of the old-fashioned gravity stamps, mostly operated by water power. Lately the water-power has been supplanted, in many important cases, by electric motors supplied from long-distance transmission circuits. And even in these instances of progressiveness the gravity stamps are still maintained. It would seem, therefore, that the electric stamp inventor has not succeeded in meeting the numerous requirements and peculiarities of duty now fulfilled best by the old-style and very clumsy drop stamp.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

Another week of very heavy dealing on the New York Stock Exchange has just closed, and, while many new records of high prices were made, there was a slight reactionary tendency. However, the market closed the week aggressively strong. The general business situation remains about the same, with a most encouraging outlook for prosperity in all industrial lines. The copper stocks are booming, owing to the tremendous and growing demand for copper. This is largely due to the great quantities of the metal used in electrical apparatus and installations. Similar conditions prevail in the iron industry. Our production of pig iron for 1898 is estimated to be in the vicinity of 12,000,000 tons. Our iron manufacturers have invaded foreign markets successfully on the merits of their products, and we are shipping many tons of rails to Europe. The record of business failures for 1898 shows a decrease of 18 per cent in the total liabilities as compared with the previous year, and of 46 per cent as compared with 1896.

On the New York exchange General Electric closed at 99 bid and 99½ asked, a gain of 3¾ points for the week. On Tuesday this stock reached its record price of 100½. Edison Electric Illuminating of New York closed the week at 190 bid and 195 asked, with no sales. Western Union closed at 95⅛ bid and 95¼ asked, a gain of two points for the week.

On the Boston exchange American Bell Telephone closed at 274½ bid and 275½ asked. Erie Telephone closed at 88 bid and 90 asked. General Electric preferred closed at 166 asked and no bid price. On the Philadelphia exchange Electric Storage battery common closed at 58⅞ bid and 59 asked.

Wall Street, January 7, 1899.

LATE NEWS.

The Electric Cable Splicers' Union, of New York city, has been incorporated under the laws of New York State "for mutual benefit and social purposes."

A meeting of electric wire and cable manufacturers was held in Chicago on Monday of this week to confer with Mr. W. H Merrill, chief inspector of the National Board of Fire Underwriters, in regard to standard thicknesses of insulation for the various sizes and kinds of wire and cable.

The United Lighting and Heating Company has been incorporated at Trenton, N. J., with a capital of $12,000,000. The principal object of the company is understood to be the consolidation of the companies having public lighting contracts in the East, particularly in New Jersey and Pennsylvania. It is reported that the Widener–Elkins syndicate is the real promoter of the enterprise.

At a meeting of the board of directors of the People's Light and Power Company, in Newark, N.J., last week, it was decided to increase the capital stock from $5,000,000 to $20,000,000 in view of the absorption of the Hoboken and Elizabeth Electric Light companies. The People's company has no bonded indebtedness. and the officers say that not more than one-third of the authorized increase in stock will be issued at present.

John B. Wallace, manager of the Wallace Electric Company, Marquette Building, Chicago, has filed a petition in voluntary bankruptcy in the United States District Court. The liabilities are $236,238. Mr. Wallace mentions no assets in his petition. The petitioner had labored several years under a burden of debts contracted in connection with the failure of the firm of Wallace & Sons, dealers in electrical supplies, Ansonia, Ct., in 1893. The petitioner's creditors are nearly all in Ansonia.

The Electric Company of America, with a capital of $25,000,000, has been incorporated at Trenton, N. J. The company's charter is a broad one, permitting it to manufacture, purchase, own and sell everything pertaining to the production of light and power. It is stated that the principal backers of the company are the United Gas Improvement Company, of Philadelphia, together with the Widener–Elkins syndicate. William C. Whitney denies the report that he is connected with the company.

It is announced that the plant of the Fort Wayne Electric Corporation will remain in operation at Fort Wayne, Ind. It is said that there are at present enough orders on hand to keep the present force at work full time for some months. Mr. H J. Miller, who was the late R. T. McDonald's right-hand man, will have the books of the company audited at once. It is thought probable that the company may be reorganized, but this question has not as yet been discussed. It is also stated that Mr. McDonald's private affairs are in no way connected with those of the Fort Wayne Electric Corporation.

In pursuance of an agreement between the Westinghouse Electric and Manufacturing Company and the Walker Company the issue of $2,500,000 of first mortgage bonds of the last-named company has been divided into two classes. All of the bonds were purchased by the Westinghouse company, and the directors of that company agreed to make $1,650,000 of them a second mortgage. The necessary legal steps have just been taken in Cleveland to have the mortgages on the Walker plant properly classed. There is now a first mortgage of $850,000 and a second mortgage of $1,650,000, the bonds issued under the latter still being in the hands of the Westinghouse company.

New York Electrical Society.

The 193d meeting of the society will be held at the College of the City of New York, Lexington avenue and Twenty-third street, on Thursday, January 12, at 8 P. M. Mr. Joseph Appleton will lecture on "Latest Progress in Storage Battery Installations." The lecture will be illustrated by slides, photographs and diagrams showing the most recent development in storage battery application to central lighting stations, railway and power plants with different methods of operation and control, battery sub-stations with rotary converters, office buildings with electric elevators and isolated plants, etc.

After the lecture a visit will be paid to the storage battery power sub-station of the Metropolitan Street Railway Company at the foot of West Twenty-third street. where will be seen in operation a large railroad battery equipped with booster and all appurtenances. Attendants will be on hand to explain the construction, and give complete information concerning the use of this modern adjunct to railway power work.

"The Technology Review."

A graduates' magazine, "The Technology Review," has just been issued by the recently organized Association of Class Secretaries of the Massachusetts Institute of Technology at Boston. It is an octavo volume of 140 pages, attractive in appearance and of the best workmanship. The cover, designed by Hapgood and printed on army brown paper, is very handsome.

The first number contains the announcement; a photograph with biographical sketch of President Crafts; articles on "The Function of the Laboratory," by Prof. Silas W. Holman, and on the "Pierce Building," by Prof. Eleazer B. Homer, the architect; reprints in facsimile of early institute documents and letters—all in the first and more general half. The latter half, 70 pages, is given to news of the Institute, of the undergraduate and graduate classes.

Plans are shown of the several floors of the new Pierce Building, of the first floor of the Rogers Building, as now altered, and of the dynamo house. There are two half-tone inserts and two line drawings, one by Gelett Burgess. An excellent review of Professor Holman's recent book on "Matter, Energy, Force and Work" is given by Dr. Goodwin.

In spite of the fact that Keely's secret died with him, we beg to assure the stockholders of the Keely Motor Company that their stock is worth just as much as ever it was.

During the past week lake copper was quoted at 13 cents, and the demand for the metal is almost unprecedented. This is largely due to the constantly increasing use of copper for electrical purposes.

One of the odd things of this end of the century is the use of acetylene gas as a would-be competitor of the electric light, while the source of acetylene commercially is calcium carbide, which it appears can not be produced without the high temperature afforded by the electric current. The transformations are, electric arc, producing calcium carbide and carbonic oxide; calcium carbide and water producing acetylene gas, which gives light. The oddity would hardly be more striking if the ordinary gas retort were to be heated by an electric current instead of coal. Truly, the "endless chain" of nature is wonderful.

PERSONAL.

Mr. Stephen D. Field, the well known electrical inventor, of Stockbridge, Mass., will sail for Europe this week, to be absent several months.

Mr. H. B. Thayer, of the Western Electric Company, New York city, entertained a number of English engineers at dinner last week at the Waldorf-Astoria.

Mr. Edwin S. Boyer, formerly of Philadelphia, has taken charge of the New York office of the American Engine Company, of Bound Brook, N. J., just opened in the White Building, at 95 Liberty street.

Mr. Angus S. Hibbard, general manager of the Chicago Telephone Company, visited New York city last week and gave a little dinner at the Waldorf-Astoria to Messrs. W. D. Sargent and J. C. Reilly, of the New York & New Jersey Telephone Company.

Mr. W. A. Vail, of the Central Union Telephone Company, Indianapolis, was among the out-of-town visitors to New York city last week. Mr. Vail reports a large increase in the Central Union's list of subscribers under the energetic and progressive policy adopted by President W. A. Jackson.

Hon. Henry L. Storke, of Auburn, N. Y., president of the Empire State Telephone and Telegraph Company, and postmaster of Auburn for five years, received from the post-office employés a handsome solid silver service as a mark of their esteem on his retirement from the postmastership at the close of the year.

Passed Assistant Engineer Walter M. McFarland, U. S. N., has been nominated by the President to be chief engineer. He has also been granted six months' leave by the Navy Department, and last week assumed his new duties as assistant general manager of the Westinghouse Electric and Manufacturing Company, to which position he was recently appointed.

Mr. David Young, of Newark, N. J., has been elected president of the North Hudson County Railway Company, of New Jersey. He is the general manager and vice-president of the North Jersey Street Railway Company, which controls nearly all the street-car lines in Hudson and Essex counties. His election confirms the report that the controlling stock in the company had been purchased by the stockholders of the North Jersey company, and indicates that the two companies are now under the same management.

LEGAL NOTES.

There has been a long and bitter controversy between the Brightwood Railway Company, a suburban Washington, D. C., road, using an overhead trolley to the entrance of the city on Ninth street, N. W., and the Metropolitan Traction Company, who meet their line with an underground line. The Brightwood company want reciprocal exchange of cars or trains between their line and the Ninth street Metropolitan line, and have applied to the courts to obtain the exchange they seek. The Metropolitan company have just filed an answer to the petition of the Brightwood company wherein it recites as follows: The execution, or attempted execution, of such an arrangement would interfere with, impair and destroy the Metropolitan company's underground electrical system and would involve financial embarrassment and prevent the just payments of its debts. The Metropolitan company claim their system would be damaged to the extent of $100,000 by such an arrangement being carried out. In lieu of the Brightwood company's proposition the Metropolitan company propose to haul as trailers such a number of the Brightwood company's cars as will satisfactorily accommodate the Brightwood company's interurban travel.

The Rhode Island Supreme Court on December 28 decided in favor of Pardon Armington and Gardiner C. Sims in the suit that they brought against Julius Palmer and other organizers of the new Armington & Sims Company to prevent the use of their name in the new organization. It was decided both on demurrer and on its merits. The complainants were formerly partners under the name of Armington & Sims. In 1883 they organized the Armington & Sims Engine Company. In August, 1896, the corporation became involved and made an agreement with a committee of creditors. The indebtedness was extended for three years, $35,000 was advanced by certain creditors, the control of the business was given to the committee of creditors. The property was sold at auction and the purchasers organized a new corporation under the name of Armington & Sims Company. In submitting the case on its merits both sides agreed that the respondents had the right to make and sell the Armington & Sims engine, the only contention being that of the right to use the name of the former maker, the Armington & Sims Engine Company, which had become known and established, and to which the stock of the original Armington & Sims Company had been surrendered and canceled, and thus the original corporation had ceased to exist. The defence was that having the right to make the engine the respondents had the right to use the name, which, for this reason, could not injure Messrs. Armington and Sims. The court says that the respondents did not acquire the right to use the name by purchase. They bought only the plant, machinery, stock and such visible property. Mr. Sims informs the ELECTRICAL REVIEW that he has never had any interest in the new company.

The Two-Ball Lamp Adjuster.

The Electric Appliance Company, of Chicago, have taken the selling agency for the two ball lamp adjuster,

THE TWO-BALL LAMP ADJUSTER.

which is illustrated herewith. Great claims are made for this adjuster as to simplicity, durability, etc. There being no springs or special mechanism used in the device, it can not get out of order, and is practically indestructible. It is inexpensive and at the same time ornamental, and will undoubtedly find a wide field of application, where a simple, practical and durable device of the sort is in demand.

Three suits will be brought against the Third Avenue Railroad Company, of New York city, by property owners in Amsterdam avenue to prevent another underground trolley road between 72d street and 125th street.

ELECTRIC LIGHT FLASHES.

The city electrician of Chicago has a plan to utilize the new drainage canal for the lighting of the city by electricity.

The Canadian General Electric Company, of Ottawa, will build the electric power-house for the canal gates at Soulanges.

The Dallas, Tex., Electric Company is preparing to make the contemplated $200,000 worth of improvements to its plant.

The Swedesboro, Mich., Light, Heat and Power Company has elected C. D. Lippincott president; H. W. Ridgway, secretary, and John C. Rulon, treasurer.

The People's Light and Power Company, of Newark, N. J., will increase its capital stock from $5,000,000 to $20,000,000, in order to take in other companies.

At the annual meeting of the Albion, Mich., Electric Light Company the following officers were elected: President, E P. Robertson; vice-president, A. J. Gale; secretary, A. N. Foote; treasurer, W. O'Donoghue; manager, W. A. Foote, Jackson. A six per cent dividend was declared. Several improvements in the plant are in prospect.

The waterworks and electric light plant at Montpelier, Ind., have been sold at receiver's sale for $1. It was purchased by Joseph Shoemaker, of the Farmers' Deposit Bank, who held a mortgage of $15,000 on the plant, and represented other parties who held mortgages aggregating $10,000. Receiver A. J. Newbauer, of that city, says the plant is valued at $50,000.

An electric light company has been incorporated at Harrisburg, Pa., to take over all the companies controlled by the Pennsylvania Manufacturing, Light and Power Company. The proposed capital is $25,000,000 stock and $10,000,000 bonds. It is proposed to call an installment of 10 per cent when the shares are issued. The securities are to be listed on the Philadelphia Stock Exchange.

The Southern California Power Company has completed its long-distance electrical enterprise, and is now ready to supply Los Angeles, Cal., and surrounding towns with electricity, carried on wires for 80 miles. The plant has cost $600,000. The enterprise has been projected and carried through by the Southern California Power Company, the stock of which has recently been sold to the Edison Electric Company.

Continuous Full Load for Central Stations.

To load a lighting station up to its maximum output is not difficult during early Winter evenings. We are all conversant with the ordinary station curve, which shows a low level line from midnight to daylight, a sudden and disproportionate drop in the early morning hours, a sudden leap to maximum output by 5 P. M., and a steadily descending line to midnight. During 16 hours out of the 24 fixed charges continue constant and operating expenses are only slightly decreased, but the revenue shows a curve coincident with that of the load. The fixed charges on the apparatus which carries the peak have to be earned in a few hours each day. It is an important problem and one to which central station managers and engineers have given much time and thought, all arriving at the conclusion that, reduced to its simplest expression, it is a mere question of supply and demand, in the discussion of which customers and station must conciliate their interests to mutual advantage. Thus, when the station is most heavily loaded, that is, when the demand is great and the supply restricted, then those participating in the supply should pay a more equitable share towards fixed charges in conformity with the fundamental principles of economic law. When the station is least loaded, that is, when the demand is restricted and there is a superfluity of supply, greater liberality of charge is permissible.

Reduction in price is, without doubt, the only means which experience shows can be successfully employed to induce an increase in demand, and a consequent employment of otherwise idle machinery in the station; but to effect this reduction in price, i. e., to give a consumer electricity at one price during the hours of maximum demand on the station, and at a reduced price during the hours of medium or minimum demand, a means of recording the consumption during two distinct periods is necessary. Such a load-modifying system, however, to be successful, must essentially be independent directly or indirectly of the consumer's local conditions and depend entirely on station conditions. The high rate of charge must be coincident with the maximum peak period of the station, the low rate upon the period of smallest demand, thus giving great encouragement to the use of current at periods other than that of the station peak. This is the object

towards which central station managers are striving—to build up the daily load curve to as near the value of the maximum point as possible—not so much the flattening of the peak, but the steady elevation of the daily depression, as well as the creation of all possible local peaks not occurring at the period of station peak. Two instances of this may be cited: A newspaper office does the bulk of its work after midnight and before 3 A. M., giving a local peak at the very hours when the station peak has ordinarily subsided; users of motive power over brief periods during the day will also give what compared to the average load line, are decided peaks. To encourage such consumers the low rate must be applied, or the competition of other systems will necessarily prevail.

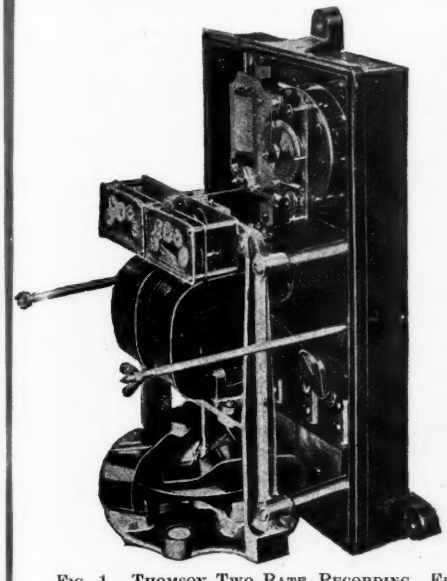


FIG. 1.—THOMSON TWO-RATE RECORDING WATTMETER, OPEN.

FIG. 2.—THOMSON TWO-RATE RECORDING WATTMETER, CLOSED.

Careful consideration of this question of station load has brought about the development by the General Electric Company of a two-rate recording wattmeter, a combination of a simple Thomson recording wattmeter with two dials and an electric or self-winding clock. By means of the clock, the connection of the meter may be changed from one dial to the other at any predetermined hour of the day. The meter itself rotates with unchanged accuracy at all times, according to varying consumption of current, but during a certain period, that during which the station peak prevails, the meter mechanism is connected by a link clutch to the right-hand dial and the consumption during the prevalence of the station peak recorded. As the peak in the station goes down, the link clutch is thrown over by the clock, and for the balance of the 24 hours the record of the meter is shown on the dial on the left-hand side. The clock is a timepiece of high accuracy, wound half-hourly by electro-magnetic means, the necessary energy for this being derived from the circuit on which the meter is installed. A setting mechanism allows the clock to be set at the time of day the meter is installed, while another mechanism regulates the movement of the link clutch to correspond with the periods of station peak. The central station is thus in a position to learn exactly how much current has been consumed during the hours of maximum demand, and how much at other times, charging a high rate for the energy recorded on the right-hand dial, and a low rate for the record on the left-hand dial.

It will be seen that the two-rate system is based entirely upon the condition of the station—that of supply and demand, and not upon any conditions local to the consumer. The condition of the load on a station using two-rate meters is also shown by the curve. With the discouragement of local peaks coinciding with the main station peak—the really objectionable peak—is a steady stimulation to creation of local peaks not occurring at the same time as the station peak, and this, putting a premium on heavy consumption when the station is lightly loaded, not only breaks down the main peak, but also tends to build up the average station line by the introduction of the local peaks. It does not, however, discourage the small consumer, since he benefits as much by the low rate during the period of minimum demand as does the large consumer. He is encouraged in the same ratio, and securing his current cheaper is prone to increase his consumption, tending to raise the average load line of the station. The heavy line curve shows the result which will probably be obtained.

Argument has been made against the two-rate system on the basis of the premise that no business is obtainable during the "valley" hours; i. e., the hours non-coincident with the peak. Now, if the gas curve of any city during 24 hours be reduced to a unit common both to electricity and gas—say candle hours—and be then superimposed on the output curve of the electric station for the same 24 hours, calculated in the same unit, it will be found that, while the general shapes of both curves closely coincide, the total area of the gas curve is so much greater than that of the electric curve, if the "valley" portion of the gas curve could be taken away from the gas, as it could by arrangement of price charged, and added to the corresponding period of the electric curve, the "valley" in the latter would be built up. So much so, indeed, that the "valley" would be but little lower than the peak. This fact alone would tend to prove conclusively that during the "valley" hours there is much available business obtainable, provided, of course, the inducement of price be made sufficiently attractive.

The two-rate meter system is just as desirable for, and may be applied to, direct or alternating-current circuits, but the meter is not interchangeable, direct-current meters being used for direct-current circuits, alternating-current meters for alternating-current circuits.

Two examples of the influence of the use of the two-rate meter system in station practice may be mentioned:

1. One large and influential station which has only recently adopted the two-rate meter has not only added over $20,000 worth of new business on the two-rate basis, but has also—and this is noteworthy—reclaimed $10,000 worth of old lost business from the gas companies.

2. In cases where a consumer uses incandescent lamps, motors and incandescent arc lamps, he is usually charged a different rate for each character of service; i. e., one rate for the incandescent lamps, another for the power service, and still a different rate for the arc lamps. Each service, measured separately, requires a separate meter. These three meters could be successfully replaced by a single two-rate meter with consequent diminished expense to the station, and, very probably, greater satisfaction to the consumer.

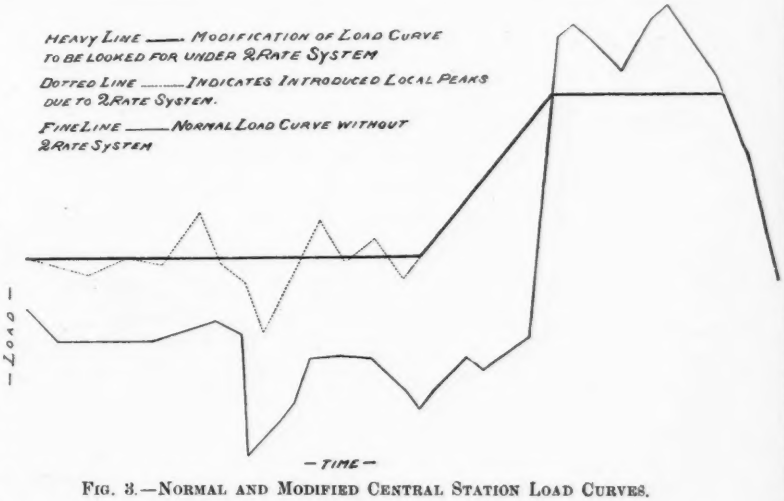

HEAVY LINE —— MODIFICATION OF LOAD CURVE TO BE LOOKED FOR UNDER 2-RATE SYSTEM
DOTTED LINE ..... INDICATES INTRODUCED LOCAL PEAKS DUE TO 2-RATE SYSTEM.
FINE LINE —— NORMAL LOAD CURVE WITHOUT 2-RATE SYSTEM
LOAD
TIME

FIG. 3.—NORMAL AND MODIFIED CENTRAL STATION LOAD CURVES.

The General Electric Company's Foreign Department.

Mr. W. J. Clark, of the General Electric Company, has accepted the position of general manager of the foreign department, with headquarters in New York.

In the reorganization of the foreign department, Mr. D. Mazenet, who for five years has held the general managership and who has piloted it from its small beginnings to its present position as one of the foremost departments of the company, becomes managing director of the Mexican General Electric Company, with headquarters in the city of Mexico.

In view of the importance which our recent foreign acquisitions and our improved relations with foreign countries will give to our commerce, especially in the field of electrical development, the scope of the foreign department will necessarily be greatly widened, and this department, already important, will, with its broader field of action, undoubtedly become the foremost in the company. It will have charge of all commercial relations between the General Electric Company and all countries outside the United States.

Mr. Clark's wide experience in foreign commercial matters peculiarly fits him for his new position. He has traveled through Europe, as well as in the countries south of us, and his familiarity with foreign methods and manners will stand him in good stead.

His book, "Commercial Cuba," recently published, is already generally acknowledged to be the standard authority on Cuban commercial affairs. He will be greatly missed from the railway department, in the management of which he made an unique record.

Telephone News .....and Comment

The New York and Hayti cable has been repaired. Communication "via Hayti" with all parts of the West Indies, Central and South America, has been restored.

The net earnings of the Mexican Telephone Company for 1898 were $39,371. The total number of subscribers now connected is 2,621, an increase for the year of 144.

The Ohio County Telephone Company and the Fordsville Telephone Company have consolidated, and have decided to build a line from Fordsville to Owensboro, Ky., direct, by way of Whitesville, Deansfield and Philpot, connecting with the Harrison exchange at Owensboro.

The output of the American Bell Telephone Company for the month and year ended December 20. 1898, was as follows:

	1898.	1897.	Increase.
Gross output.....	41.047	26.374	14,663
Returned.....	13,266	8,799	4.467
Net output.....	27,771	17.575	10,196
Year ended Dec 20.			
Gross output.....	354.559	241.271	113,288
Returned.....	148,834	92.867	55,967
Net output.....	205,725	148,404	57.321
Total outstanding..	1,125 246	922,253	202,993

The American Bell interests have absorbed the Interstate Telephone Company, which had headquarters in Tuscola, Ill. The Interstate company owned and operated several hundred miles of lines in Central Illinois, and as the local Bell company expected to cover the same territory, a compromise was effected whereby the Interstate goes out of existence.

The assets of the People's Telephone Company, of Baltimore—independent—have been ordered sold by the courts. A stay of proceedings has, however, been granted until the company holds a meeting to try and arrange its affairs. The meeting will take place early in January. The People's Telephone Company have 1,500 subscribers in Baltimore.

A suit has been started in the District Court of Des Moines, Iowa, to cut off the Iowa Bell Telephone Company from the use of the city streets. The company owns $200,000 worth of property in the city and has been doing business several years. The franchise of the Iowa company expires January 14, 1896, and the Mutual Telephone Company, organized by local men, want the right to a renewal of the franchise.

Both branches of the Kansas Legislature have passed a bill reducing telegraph rates, which will now go to the Governor for signature. It reduces the charge for day commercial messages of 10 words from 25 to 15 cents, and other tolls in proportion to all points within the state. By this measure also telegraph companies are placed within jurisdiction of the Court of Visitation, recently created to regulate railroad traffic.

Commissioner Kearny, of the Department of Public Buildings, Lighting and Supplies, of New York city, last week sent to the City Council a communication announcing that he had ordered the New York & New Jersey Telephone Company not to answer any calls on long distance telephones to other cities and out-of-town places coming from telephones in public buildings. The bills for long-distance calls for the last year, the commissioner said, had been enormous, and he was satisfied that all, or nearly all, the calls had been on private business.

The plan for the reorganization of the Home Telephone Company, of Baltimore, Md., in the interest of the shareholders' committee, has been announced by the stockholders' committee. The company is in the hands of receivers, and the property will be bought in by the stockholders, unless a fancy price is bid for it by others. If the stockholders obtain the property they will exchange stock of the new company for stock of the old company, share for share. They will also issue $400,000 in bonds, which will be used to pay the outstanding bonded debt of $90,000, with interest, and also unsecured debts of $10,000 and court costs. The balance will be used to extend the plant to 4,000 telephones. Deposits of stock are being received by the stockholders' committee.

A Big Telephone Consolidation.

The telephone system known as the "Erie system," of which Mr. Charles J. Glidden, of Lowell, is president, has recently added to its already very extensive territory the State of Michigan. The management of the Michigan Telephone Company has passed to the Erie, both organizations being licensees of the American Bell Telephone Company, of Boston. The Michigan company has 19,000 telephone subscribers, which, with the Erie, makes a total of about 50,000 subscribers included in the consolidation.

It is understood that Mr. Glidden will continue as president, with Mr. J. P. McKinstry, of Cleveland, as vice-president, and Frederick A. Forbes, of Detroit, as general manager. Hugh McMillan will be the local treasurer. The directors of the Michigan company are Messrs. McMillan, Forbes and Ashley Pond, of Detroit; Norman Williams, of Chicago; W. A. Jackson, president of the Central Union Telephone Company; Robert T. Lincoln, president of the Pullman Palace Car Company, and Col. Robert C. Clowry, of Chicago, vice-president of the Western Union Telegraph Company.

The Erie system now includes the territory of the states of Minnesota, Michigan, North and South Dakota, Texas and Arkansas, and the city of Cleveland, Ohio.

The "Progress" Dry Battery.

The Phœnix Carbon Manufacturing Company, of St. Louis, Mo., of which Col. S. G. Booker is general superintendent, announce that they have ready for the market a new dry battery, which will bear the name of "Progress." The carbon products of the Phœnix company for all electrical purposes are well known, and the announcement that they have gone into the manufacturing of complete dry batteries will probably come as a surprise.

Colonel Booker, who is widely acquainted throughout the electrical field, has succeeded by his energy and ability in placing the Phœnix products prominently before the trade, and the fact that he is behind the new battery will count largely in its favor.

The primary advantage of the "Progress" cell is that of long life. The containing vessel is sufficiently porous to allow moisture from the atmosphere to pass through it, and the filling has, in close association with the excitant, a material capable of absorbing moisture from the atmosphere

This, it is asserted, produces a battery capable of maintaining the excitant mixture in a moist state, and therefore active for a long period of time. The cell is not sealed, its contents being exposed to the atmosphere as previously explained. The containing vessel is of carbon and also acts as the negative element of the cell.

The Phœnix Carbon Manufacturing Company state that they are prepared to send samples of the "Progress" battery to any one desiring to try it.

There are now enrolled at the University of Chicago 1,621 students, an increase of 450 over a year ago.

INDUSTRIAL NOTES.

The American Engine Company, of Bound Brook, N. J., has opened an office in New York city in the White Building at 95 Liberty street.

The American Electric Vehicle Company have just issued a very neat preliminary catalogue, in which they show a few of the many styles of electric buggies, broughams and delivery wagons they are manufacturing.

The attention of readers is called to the announcement of the Wyckoff Creosoting Company. The company have lately largely increased their capacity, and are now able to take care of their largely increased business. They will take pleasure in giving valuable information to any who contemplate using conduits or cross-arms.

The Victor Telephone Manufacturing Company, of Chicago, recently installed at Ashland, Wis., a 400-number exchange telephone service for the Cheguamegon Telephone Company, of that city. It is pronounced to be one of the best and most complete exchanges in the country, all of the Victor apparatus being used. The service is highly efficient and compares with the best to be found.

The new church, known as the Pawtucketville Church, at Lowell, Mass., is being erected in accordance with plans made by architect J. Merrill Brown, of Boston. The church will be built on modern lines. Over the interior auditorium will be placed heavy steel trusses, having a clear span supporting the roof framing and ceiling. J. H. Connell & Company, Lowell, are the general contractors for the work, and the Berlin Iron Bridge Company, of East Berlin, Ct., furnish and erect the steel work.

The New England Engineering Company, of Waterbury, Ct., is one of the most successful companies in the field engaged in the construction of electric and steam plants for lighting and power purposes. The company also makes a specialty of remodeling and modernizing old plants, and many thousands of stockholders have been delighted to have their non-productive properties become prosperous and dividend-paying under the skillful surgery of the New England Engineering Company.

The Warren Electric and Specialty Company, of Warren, Ohio, send us the following announcement: "Mr. H. W. Wiswell, electrical engineer, formerly with the General Electric Company, and who has been for the past year associated with the New York & Ohio Company as manager of their transformer department, and who designed their model '98 transformer, has resigned his position with that company, his contract having expired, and has associated himself in a similar capacity with the Warren Electric and Specialty Company. The company will place upon the market their new 'Peerless' transformers, which will be a distinct improvement upon anything now on the market, and expect to be able to make deliveries about April 1, 1899."

ELECTRIC RAILWAY NOTES.

The Dayton, Springfield & Urbana, Ohio, Electric Railway Company has increased its capital stock from $10,000 to $75,000.

The township of Rochester, Mich., has granted a franchise to John Winter to build an electric road from Pontiac to Orion, Mich.

The net earnings of the Columbus, Ohio, Street Railway Company increased 11½ per cent for December and 25 per cent for the year.

The Lynchburg, Va., Street Railway Company is extending and remodeling its plant The supervising engineers are the New England Engineering Company, of Waterbury, Ct.

The Commissioners of the city of Washington have refused the application of the Capitol Railway Company to be allowed to extend the system of underground trolley connections known there as the Brann system. The Commissioners think a system with line connections exposed a dangerous one and ask the applicants if they can not see their way to adopt the Budapest system or some similar one.

At the annual meeting of the directors of the Bennington & Hoosick Valley, N. Y., Railway Company the following officers were elected: President, George E. Greene; vice-president, Watson M. Holmes; treasurer, I. B. Gibson; secretary, Charles B. Story. At a meeting of the directors of the Hoosick Driving Park and Fair Association last evening the resignation of the secretary, Dr. E. F. Alexander, was accepted. G. Frank Rising was elected secretary.

The United States Court of Appeals for the Second Circuit, in the case of the Electric Car Company, of America, and the Thomson-Houston Electric Company against the Nassau Electric Railway Company, of Brooklyn, N. Y., has refused a rehearing of the case involving the Condict Patent No. 393,323, covering a series parallel controller. The case was one involving infringement of certain claims of the patent named, and a decree granting a preliminary injunction was granted on September 13, 1898.

The electric railroad known as the Los Angeles & Pasadena, Cal., Railroad Company, operating between Los Angeles and Altadena, has passed into the possession of the Southern Pacific Company, the purchase price being $1,000,000. C. P. Huntington, H. E. Huntington, A. Borel, Christian De Guigne and I. W. Hellman are named as the purchasers of the property, which was formerly owned by Andrew McNally, S. O. Sprague and C. W. Smith, of Chicago; Stephen Green, of Philadelphia, and Col. G. G. Green, of Woodbury, N. J. The road consists of about 40 miles of track, and extensive improvements will be made by the purchasers.

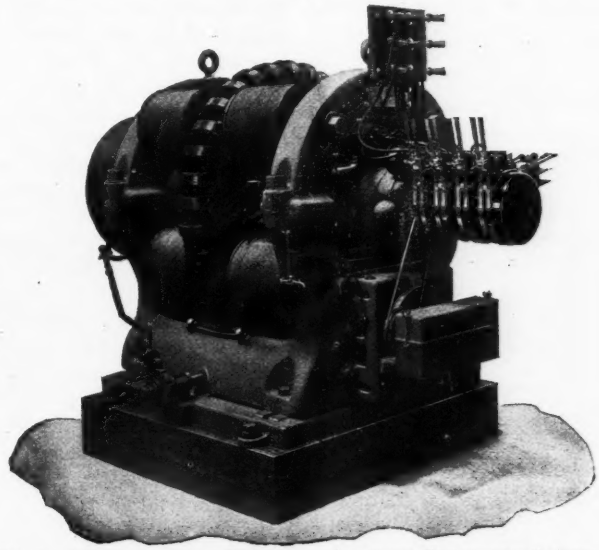


FIG. 1.—"REGULATION OF SERIES ARC LIGHTING GENERATORS."—BRUSH MULTIPLE ARC GENERATOR. (See page 28.)

At the regular quarterly report of the Buffalo, Tonawanda & Niagara Falls, N. Y., Electric Railway Company for the quarter ended on September 30, shows: Gross earnings from operation, $1,286.03; operating expenses, $1,605.54; net earnings from operation, $319.51; other income, $20.83; gross income (deficit), $298.62; fixed charges, $244.87; net income from all sources (deficit), $543.89. The general balance sheet shows assets of $1,805,127.15, including $1,803,115.84 for cost of road and equipment; $34.21 cash on hand and $543.49 profit and loss (deficiency). The liabilities include $1,500,000 capital stock, common; $300,000, funded debt.

FIG. 2.—"REGULATION OF SERIES ARC LIGHTING GENERATORS."—FORM 2 REGULATOR. (See page 28.)

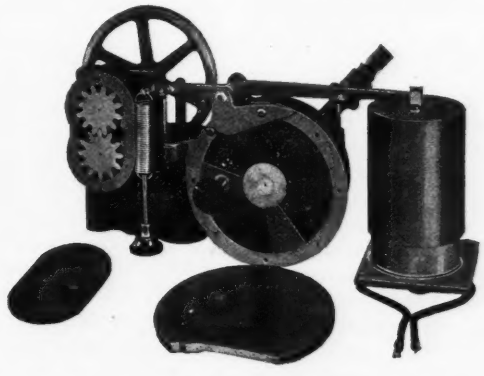


FIG. 3.—"REGULATION OF SERIES ARC LIGHTING GENERATORS."—REGULATOR WITH CASE REMOVED. (See page 28.)

OUR CHICAGO LETTER.

The Northwestern Elevated Railroad Company have been granted until December 31, 1899, to complete the system.

The Metropolitan Elevated Railroad was formally transferred from the courts to the reorganization committee at noon January 4. Bids had been advertised for, but the only bidder was Mr. Joliff, the agent for the reorganization committee. The purchase price was $6,000,000. The entire interest on the property is now represented by the reorganization committee, who will take charge of the road. Nine million in preferred stock will go to the old bondholders and shareholders at 53⅓ per cent and 46⅔ per cent, respectively. The plan also provides 40 per cent scaling of the bonds, and the old shareholders will receive $1,000,000 in bonds.

The Western Society of Engineers held their annual banquet and election of officers at the Technical Club on the evening of January 3. Onward Bates was elected president to succeed A. Noble. Prof. N. O. Whitney was chosen vice-president; C. W. Melcher, treasurer; Nielson L. Litten, secretary, and A. Ziessing, trustee. The toastmaster of the evening was Mr. W. J. Karner, and among the speakers were Robert A. Hunt, Isham Randolph, Lyman E. Cooley and Willard A. Smith. Mr. Smith urged that the society appoint a committee to cooperate with the American Society of Engineers in securing a creditable engineering exhibit in the coming exposition of 1900 at Paris. The committee will be appointed at the next regular business meeting.

In Peoria, Ill., the Central Railway Company may get a 50-year franchise. They have asked the City Council the privilege, agreeing to pay into the city $25,000 annually during the term of the franchise on condition of a straight five-cent fare and to abolish transfers. Efforts were made to suspend action until after repeal of Allen law now before the legislature, but these were defeated. The fight has been going on for more than a year and it is feared the Allen law advocates may win.

In the town of Ottawa, Ill., L. B. Merrifield and others have asked a franchise to carry on a general electric lighting business, to compete with the Thomas Electric Light and Power Company, who have had a monopoly for 20 years and own the water-power. Many business men and property-owners are satisfied with the present company and oppose the granting of a new franchise. F. E. C.

Chicago, January 7, 1899.

Regulation of Series Arc-Lighting Generators.

As the series arc-lighting generator has been gradually increased in size, the adoption of improved methods of regulation has become more imperative. The nerve center of a series arc system being the regulator, however nearly perfect the other apparatus may be, satisfactory lighting can not be obtained unless the regulator itself performs its full duty. The General Electric Company has therefore developed for four-pole Brush arc generators, the form 2 regulator, the design of which is the outcome of careful study and investigation, as well as the examination of data obtained from the operation of Brush arc regulators throughout the country.

The Form 2 regulator is simple both in construction and operation. Its mechanism is contained in a rectangular case placed on the machine directly beneath the commutator. A separate wall-controller is not required; hence no additional leads need be run from the generator. In maintaining constant current the regulator performs two simultaneous operations; viz., it sweeps a set of rheostat contacts, varying the resistance of the field shunt, and rocks the brushes back or forth to keep the spark length at a minimum.

The mechanism consists of a rotary oil pump, driven by a belt from the armature shaft, a rotary piston in a short cylinder with ports, and a balanced valve, which regulates the flow of oil into the cylinder. The valve is operated by a lever which supports the armature of a controlling electromagnet, energized by the main generator current. The pull on its armature varies, therefore, with this current. At normal current the valve is in its middle position, and the oil may flow through the overlapping ports and back into the case without moving the piston. Should the current rise above normal, the controlling armature is drawn down, raising the valve and diverting the oil through the upper ports into the piston, at the same time allowing it to run out from the piston case through the lower ports as the piston rotates in a clockwise direction. As the piston is mounted on a shaft moving the rheostat arm and the brush-holder rocker arm, its movement immediately corrects the rise in current. When the current returns to normal the controlling magnet releases, and the valve lowers and prevents further flow of oil against the piston, which remains stationary until the valve is again moved to compensate for any change in the current. Should the current fall below normal, this operation is reversed.

The high efficiency of this regulator is due to the fact that it does not "hunt"; i. e., constantly attempt to change the current. When the current is subject to a sudden and large variation the controlling magnet is

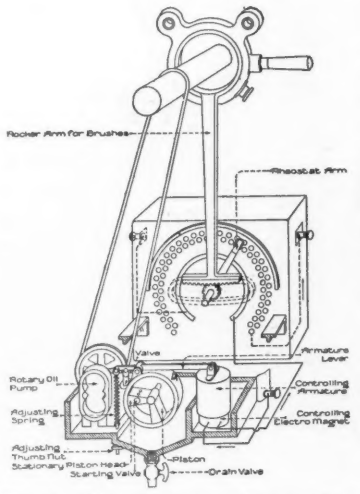


FIG. 4.—"REGULATION OF SERIES ARC LIGHTING GENERATORS"—DIAGRAM OF PARTS.

affected in the same proportion; hence the ports are opened wide and the full pressure of the oil is brought to bear on the proper side of the piston. As the current approaches normal the controlling magnet weakens and the valve is gradually moved towards its middle position, which it reaches just as the current returns to normal.

It is evident that the piston and, therefore, the rheostat arm and the brushes will move more rapidly when the ports are wide open than when they are nearly closed. The means for correcting variations of current are thus most effective when most needed. The actual time required to bring the current back to normal from a dead short-circuit is from three and one-half to four seconds. The use of rapidly moving reciprocating parts has been avoided, and when properly adjusted the regulator operates without oscillating action.

At one end of the armature lever is an adjusting spring, the tension of which is regulated by a hard rubber knob outside of the box. With this spring the armature may be adjusted for a predetermined current, and this is the only adjustment necessary. As the spring is not in circuit and is not subject to temperature changes, the adjustment is not likely to change. The adjusting knob may be handled without danger when the machine is in operation. The stops for the controlling lever may be so arranged that the regulator will operate more quickly in one direction than in the other, while a device is provided which allows the regulator to be thrown entirely out of operation. A change in direction of rotation of the generator requires in the regulator only a change in the position of the two stopper plugs in the oil pump. A safety valve is provided to relieve the pump from excessive pressure. All electrical connections of the regulator are made to stationary binding-posts and there are no sparking contacts. As the case is dust-proof, destructive grit resulting from sandpapering the commutator can not affect the regulator, and as it is partly full of oil at all times, the bearing surfaces are thoroughly lubricated, and wear is consequently reduced. Thus, thorough protection of the mechanism and careful provision for its lubrication increase the reliability of the regulator, and it will remain longer in proper adjustment and require far less repair than one exposed to dust and dirt.

The Form 2 regulator has been built so that it may be substituted for the Form 1 regulator (operated by magnetic clutches), either with new rheostat or fitted to the old rheostat.

The Columbia Railway Company, of Washington, D. C., has filed a deed of trust for $500,000, the American Surety and Trust Company being the trustees. The deed is to guarantee an issue of bonds of $500 each, paying five per cent, to run for 15 years, the money to be used in the Benning road extension of their underground electric system. The change in this company's line from cable to underground electric was mentioned in the ELECTRICAL REVIEW a few weeks ago.

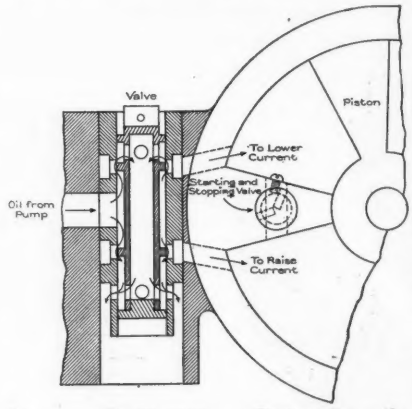


FIG. 5.—"REGULATION OF SERIES ARC LIGHTING GENERATORS"—SECTION OF VALVE IN MIDDLE POSITION.

Prof. John Trowbridge on the Regions of the Upper Air.

[*From The Forum.*]

At the paltry distance of 10 miles above the earth the air is too thin to support respiration, and the thermometer would register far below zero. A person in a balloon could not hear a friend in a neighboring balloon, even if they were near enough to shake hands. There would be no medium for the propagation of sound waves. There would, however, still be a medium for the conduction of electricity—a medium in fact of great conductibility—almost as good as a metal; and it is this medium at even a less height which Tesla proposes to use in his methods of transmitting power hundreds of miles through the air without wires.

My recent experiences with very high electro-motive forces lead me to believe that great difficulty would be met in preventing flow from the generating apparatus to the earth; for, under an electrical pressure of two or three million volts, atmospheric air, even at the surface of the earth, is a fair conductor. Before one reached the height of 10 miles—where there is greatly increased conductibility—the electricity would have deserted the terminal raised to that height and would have flowed to the ground instead of taking the path through the air to the distant station.

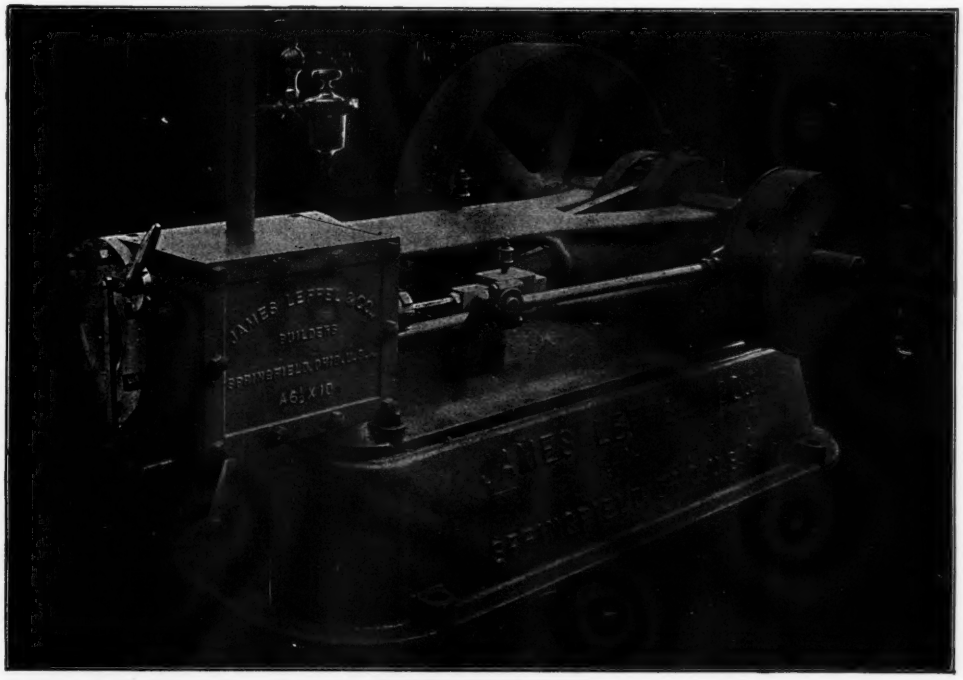
If, however, the upper regions of the air are practically employed for the transmission of power, the astronomical observers will be compelled to change the sites of their observatories to deserted mountain regions far from the neighborhood of cities; for there would be a fine display of celestial fireworks in the shape of luminous electrical discharges. Practical electricity now claims the earth as its own; it is no longer possible to make magnetic observations in our physical laboratories, on account of the trolley roads. Is it possible that the upper regions of the air will be preempted, leaving the astro-physicists no alternative but refuge in some desolate and far-distant region?

The Metropolitan Elevated Road, of Chicago, was sold last week by Master-in-Chancery Sherman for $6,000,000. The road was bought by Frederic P. Olcott, of New York, chairman of the reorganization committee, in the interest of those security-holders who have deposited their stocks and bonds with the reorganization committee under the terms of the agreement put out some months ago.

The Leffel Automatic Engine.

The accompanying illustration shows one of the 6½ by 10 class "B," standard, center crank, automatic cut-off engines now being built, in sizes from 12 to 50 horse-power, by James Leffel & Company, Springfield, Ohio. The specialties of this firm consist of steam engines, boilers and water-wheels, in which business they have been continuously engaged for over 37 years, and have kept fully abreast of the times in improvements in their lines. It will be noticed this engine is of a specially good design, affording an extra strong, stiff and substantial construction throughout. It is of very symmetrical and well-balanced proportions, and is not complicated in any way that requires the services of an expert to look after and keep in order. These engines being built in the smaller sizes, are designed to be used mainly where a good, strong and substantial power is required, that is economical, as well as easily handled. The class "B" engines are provided with a balanced slide valve of what is usually termed "the pressure-plate pattern;" that is, the valve operates between the valve seat and pressure-plate on the back of the valve, supported by distance pieces on each side in the usual manner, and held in place by suitable springs between the pressure-plate and steam-chest lid, affording provision for the pressure-plate and valve to leave the seat and leave the cylinder in case of an over quantity of water. The illustration also shows a very simple, yet efficient and convenient, single lever drain-cock system, by means of which the drain-cocks underneath the cylinder and steam-chest are all operated with one lever, which is in plain sight and within easy reach from the throttle-valve. The outlet from these drain-cocks is conducted into the exhaust-pipe.

Instead of these engines now being equipped with the type of incased governor shown in the illustration, the builders are using the Rites governing system, and are prepared to guarantee closest regulation with best possible efficiency in the various sizes they are building. These engines are admirably well adapted for smaller electric and power plants and are put in under a positive guarantee.



THE LEFFEL AUTOMATIC ENGINE.

Calendars and Advertising Novelties.

The American Legion of Honor is sending out a large and distinct wall calendar, printed in two colors.

Louis Belcher, printer, 5 Cedar street, New York city, has issued a wall calendar, printed in two colors and gold.

William Wright's Sons, New York city, who make a specialty of boiler setting, furnace repairs and engine foundations, are sending out a neat steel-engraved calendar.

The Okonite Company, 253 Broadway, New York, are sending to their many customers and friends neat calendars ornamented with tinted French pictures in colors.

The Direct United States Cable Company, Limited, is distributing its annual pad calendar, which emphasizes their request to "Mark all cablegrams via Direct Cable."

The Warren Electric and Specialty Company, of Warren, Ohio, manufacturers of the "Peerless" incandescent lamps, are favoring their friends with an attractive calendar, embellished with a handsome half-tone illustration showing the ruins of Conway Castle in North Wales.

The G. F. Brunt Porcelain Works, of East Liverpool, Ohio, manufacturers of high-grade porcelain for electrical purposes, have sent to the ELECTRICAL REVIEW one of the handsomest calendars of the season. It consists of six sheets, each carrying a calendar for two months, as well as a beautiful picture in colors. The pictures represent women attired in military and naval uniforms.

The James Kempster Printing Company, 117–119–121 Liberty street, New York, have again issued their calendar, which has been recognized as the standard among the friends of this large printing house. No more convenient or acceptable calendar comes to the ELECTRICAL REVIEW than this one, as it seems to be about the right size and proportion for an editor's desk. The printed motto on each of these calendars is from Mr. Kempster's friend, Pericles, who at one time said "Time is the king of man."

Chinese Telegraphy.

In an article in the current number of the *Engineering Magazine* on "Industrial Progress in China," by J. S. Fearon and E. P. Allen, these interesting statements are made: "The telegraph is the only institution of modern science which has obtained any considerable foothold in China. Pekin is connected by wire with Tientsin and with Manchurian points up to the Russian frontier, whence connection is continued by Russian-Siberian lines to Europe. The capital is also connected with all the treaty ports and principal cities in China proper, and these again with each other. Canton has connection also through Yünnan with Burma. China learned the value of the telegraph in the war with France, and it has long since been admitted to have 'become indispensable.' The telegraph, however, is under imperial control, and there is probably little opportunity for its extension as a private enterprise. Chinese writing being not alphabetic, but syllabic, and there being as many characters as there are words in use, the telegraphic messages are sent in a number cipher. For transcribing messages received a double-ended type is used; on one end is the character, and on the other the corresponding number. When a message is received it is set up by the numbers, and then printed from the reverse, or character end."

Electricity in the Separation of Metals.

What has been accomplished by the use of electricity in separating the metals on a large scale can be seen from the following data: In 1897 one-third of the entire copper produced (137,000,000 kilograms) was obtained electrolytically. The larger part of the gold and silver were obtained in the same way. Sodium is produced entirely by electrolysis (260,000 kilograms in 1897), and the increase in the aluminum produced, from 9,500 kilograms in 1888 to 321,000 kilograms in 1894, is to be referred to the same cause. This aluminum can now be used for the preparation of other metals which were difficult to obtain. At the last meeting of the Electro-Chemical Society in Leipsic we saw almost chemically pure chromium prepared by suitably igniting a mixture of aluminum and chromium oxide. In the same manner manganese, titanium, tungsten, vanadium, cerium, etc., were formed. This opens up a field in the metal alloys which will, perhaps, be of technical importance.—*Science.*

ADVANCE INFORMATION

Electric Light and Power.

OWENTON, KY.—Arnold & Riley contemplate the establishment of an electric light plant.

LAKE PROVIDENCE, LA. — The Mayor may be addressed concerning the proposed issuance of $7,500 in bonds to buy an electric lighting and water supply system and for other purposes.

BALTIMORE, MD —The Tuxedo & Embla Parks Water and Light Company is arranging to award contracts soon for the construction of its proposed electric light and water plants.

DOVER, ME.—The Milo Electric Light and Power Company has been organized, with Julian d'Este, president and treasurer, for the purpose of heating and lighting the towns of Milo, Sebec and Brownville; capital stock, $10,000,

ELIZABETH CITY, N. C. — The Carolina New Light Company has been organized by J. B. Griggs, W. T. Old, D. B. Bradford and others; capital stock, $25,000.

WAYNE, NEB.—The electric light system has started up here and promises to be entirely satisfactory in every respect. The entire city and most of the business houses are lighted and the citizens are correspondingly well pleased.

RED WING, MINN.—Pine Island is to be supplied with electric light service through connection from the plant which E. L. Peck is building at Zumbrota, seven miles distant.

MONCTON, N. B.—The town is considering the question of making extensive changes to its electric light plant.

THOROLD, ONT.—The tender of the Royal Electric Company for the addition to the electric light plant has been recommended for acceptance.

CHICAGO, ILL.—The Magic Light Company, with a capital stock of $2,700, has been incorporated; incorporators, Franz Gersdorff, Henry Ressing and Charles Fritz.

REDLANDS, CAL.—The Redlands Electric Light and Power Company, of this city, is extending its lines at Colton to the cement works, to furnish power there.

DILLSBORO, IND.—This place is agitating the electric light question.

SPARTANSBURG, S. C.—Arch. B. Calvert, Mayor, may be addressed concerning electric light plant.

ATHENS, TENN.—W. S. Hoge will establish an electric light plant.

SEDALIA, MO —W. H. Powell has applied to the City Council for franchise to erect and operate electric light plant.

GREENVILLE, MISS.—The People's Light Company has been incorporated by Harley Metcalfe, Fred Metcalfe, George Metcalfe, Lucien C. Gwin, Mary L. Wheatley and George Wheatley; capital stock, $15,000.

New Electric Railways.

CHICAGO, ILL.—The Citizens' Electrical Railway Company has been incorporated by R. R. Reynolds and J. G. Latimer to build and operate a street railway; capital stock, $10,000.

ELMIRA, N. Y.—Plans for the electric road to connect this place and Seneca Lake have been completed, and the work will be commenced as soon as the ground is in condition.

PONTIAC, MICH.—A franchise has been granted to John Winters and O. H. Law, of Detroit, for an electric road to this city.

DETROIT, MICH.—The Jackson & Adrian Railway Company has been organized for the purpose of building an electric line between the two cities.

SOUTH NORWALK, CT.—Norwalk and Danbury are to be connected by a trolley line this year.

New Telephone and Telegraph Companies.

CARTER CITY, KY.—A telephone line is being built from this city to Vanceburg.

PUEBLO, COLO.—A telegraph line is to be constructed between this place and La Junta. Work on the new line will be commenced in a few days.

VINTON, CAL.—The Vinton Telephone Company has been incorporated by A. B. Bentley, L. H. Dunning, E. Ramelli, J. Bates and F. Campbell; capital stock, $20,000.

NEBRASKA CITY, NEB.—The Nebraska City Telephone Company has been incorporated by H. A. Cott, C. H. Lanham and H. M. McCurry; capital stock, $25,000.

WACO, TEX. — The Independent Telephone Company has been incorporated by S. Sawyer, E. N. Stephenson, J. B. Earll and others to operate telephone and telegraph lines; capital stock, $75,000.

LAWRENCE, KAS —The Kansas-Missouri Telephone Company is erecting long-distance telephone line.

FAYETTEVILLE, ARK —The North Arkansas Telephone Company has been incorporated by Millard Berry, James W. Dupree, J. P. Dearer and Walter E. Berry; capital stock, $25,000.

GRASS VALLEY, CAL.—A contract has been let to extend the telephone line from this place to Washington.

BEEVILLE, TEX.—The Southwestern Telephone Company has completed its line from Victoria to this place.

MONON, IND.—The Monon Telephone Company has been incorporated, with a capital stock of $10,000.

NEW LONDON, IOWA—The Henry County Telephone Company has been incorporated with the Secretary of State. The capital is $1,000.

HEILMAN, IND. — J. M. Owen, local manager of the Cumberland Telephone Company, has just completed the line to this place.

ROCHESTER, N. Y.—The Empire State Telephone Company is perfecting arrangements to build a metallic circuit from Atlanta, through Naples, Middlesex and Rushville, to Geneva, connecting there with all points on their lines and also the lines of the long-distance telephone company.

REPUBLICAN CITY, NEB. — The Nebraska Telephone Company is putting in a line along the valley as far west as Superior.

ST. PETER, MINN.—The St. Peter Telephone Company has been incorporated by H. P. Proctor, Augustus Proctor, Frank A. Chase, J. E. Chase and Walter S. Proctor, to construct and operate a telephone exchange and telephone lines at St. Peter; capital stock, $10,000.

HINTON, W. VA.—The Hinton & Southeastern Telephone Company has been incorporated by A. J. Skaggs, James H. Miller, J. J. Swope, C. H. Skaggs and W. H. Bonde; capital stock, $50,000.

WATKINS, N. Y.—The new Postal Telegraph line is practically completed between this village and Tyrone, and work between the latter place and Hammondsport is well under way.

HOLLY, PA. —The Pennsylvania Telephone Company will shortly construct a new line between this place and Carlisle, and a long-distance exchange will be established at the latter place.

PADUCAH, KY.—A telephone system will be put in by Henry Biederman and associates.

SUMMERTOWN, TENN.—The Cumberland Telephone Company will extend their line from this place to Lawrenceburg.

IOLA, KAS.—The work on the new electric line between this place and Leharpe has been begun.

New Incorporations.

CHERAW, S C.—The New England Electrical Works has been incorporated by W. E. Price, E. A. Palmer, George T. Nicholls and W. P. Pollock.

PORTLAND, ME. — The Electric Mining and Reduction Company has been incorporated by E. K. Milliken, G. D. Burton, Chas. Williams, Jr., L. H. Williams and others, to manufacture electrical mining apparatus and do general mining business; capital stock, $500,000.

ST LOUIS, MO.—The Frank Adam Electric Company has been incorporated to manufacture electrical appliances; authorized capital, $25,000. Incorporators: Frank Adam, Fred B. Adam, L M. Adam.

WATESSING, N. J. — The Sprague Electric Company has been incorporated; capital stock, $5,000,000.

ST. LOUIS, MO.—The Gould Electric Protective Company has been incorporated. The capital stock is $40,000. H. V. P. Cooke, Allen T. West. Herman C. G. Luytie, Oscar H. Vieths, William T. Nolker, James T. Drummond and A. P. Gould, incorporators. The company will engage in a general electric business.

JACKSON, MISS.—The Vicksburg Electrical Supply Company has been incorporated, with a capital stock of $10,000.

PORTLAND, ME — The American Electrical Extract Company has been incorporated to manufacture extracts; authorized capital, $3,000,000; subscribed capital, $60; paid in, $60. Incorporators: G. D. Burton, Boston; L. H. Williams, Somerville, Mass.

CAMDEN, N. J. — The Electric Power Development Company has been incorporated by Marcus B. Taylor, Charles W. Kennedy, Isaac Blum, Wm. Findlay Brown and S. Y. Heebner to manufacture and supply electricity to municipalities, etc.; capital stock, $500,000.

LAKEVIEW, MISS.—The Whitfield Company has been organized by Marcy L. Whitfield, Jerome Hill, C. C. Cowan, R. B. Snowden and W. A. Percy for the manufacture, sale and operation of electrical appliances; capital stock not given.

Business Troubles

CLEVELAND, OHIO—The Ambrose Construction and Electric Company has filed a deed of assignment to the Cleveland Trust Company.

PROPOSALS FOR LIGHTING.

SEALED PROPOSALS will be received at the Borough Clerk's office, Sea Isle City, until 7 p. m., January 28, 1899, for lighting the Borough of Sea Isle City, N. J., with either incandescent or arc lights. Specifications may be obtained by addressing A. H. SICKLER, Mayor, 516 Minor St., Phila., or J. T. CHAPMAN, Borough Clerk, Sea Isle City, N. J.

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED DECEMBER 20, 1898.

616,139 Method of electrolytically treating straw or other fibrous material; G. H. Pond, Ashburnham, Mass.

616,141 616,142 Temperature-regulating apparatus; A. Roesch, Bridgeport, Ct.

616,148 Magnetic switch; C. E. Scribner, Chicago, Ill.—A base having a socket for a plug formed in it, a movable armature and switch contacts controlled thereby near the socket, a plug and a mass of magnetic material associated therewith, said mass of magnetic material or said armature being magnetized, whereby the armature is moved when the plug is in its socket.

616,165 Carbon for electric welding; C. W. de Tunzelmann, London, Eng. An electrode for electric welding, brazing and the like purposes composed of carbon and metallic oxids combined together by admixture.

616,174 Electric voting machine; F. S. Wood, Boston, Mass.—A switching device, a registering device and means for operating same, means for operating said switching device comprising a first circuit normally open at one point, means for closing same through the switch, whereby the first circuit is completed and the switch operated, thereby opening the first circuit at another point.

616,190 Electric operation of elevators by three button push systems; J. D. Ihlder, Yonkers, N. Y.—Consists of a motor and a reversing switch controlling the motor, of a circuit, including two sets of push-buttons circuit-maintaining magnets and non-interfering magnets controlling said circuit.

616,216 Cloth-cutting machine; Henry Warth, New York, N. Y.—A table, a carriage, a motor, a base-plate, a swinging arm, having a spring connection with the base-plate, and a cutter or tool mounted on and moving with the arm and connected with the motor.

616,222 Telegraph repeater; F. W. Cole, Newton, Mass.

616,265 Field-magnet for electric machines; S. H. Short, Cleveland, Ohio—A field-magnet for electric machines, having grooves formed in the pole surface, with a grid arranged to be received in said grooves.

616,276 Illuminant for incandescent electric lamps, and process of making; O. M. Thowless, Newark, N. J.—The method of applying a coating of refractory material to a filament of incandescent electric lamps, which consists in first applying a covering of readily-combustible material to the surface of the filament impregnating the same with a salt of thorium or other metal, and removing the covering of combustible material by heat or decomposition.

616,301 Pneumatic motor for electric appliances for cars; C. A. Evans, Upland, Pa.

616,339 Ammeter for alternating electric currents; W. A. Layman, St. Louis, Mo.—Consists of a suitable fixed element, a suitable movable element, a primary circuit for one of said elements, a secondary circuit for the other of said elements, and a suitable transformer, the primary coil of which is in said primary circuit for supplying current to said secondary circuit.

616,343 Electric generator for cycles; J. Moores, Manchester, Eng.

616,358 Electrically-operated regulator for dampers; G. F. Richardson, Hartford, Ct.

616,375 Coin-freed apparatus for generating X rays; M. Vidal, Paris, France—An X-ray apparatus having a coin-controlled lever, contact-pieces arranged on opposite sides of the plane in which said lever swings, and arranged to engage said lever upon opposite sides, an X-ray generator located in a circuit controlled by the said lever and contact-pieces, and a clock-work or motor for effecting an engagement of the contact devices with the lever for a predetermined period.

616,403 System of electric traction; M. Cattori, Rome, Italy.

616,405 Automatic magnetic circuit-breaker; C. M. Clark, New York, N. Y.

613,435 Electrically welded joint; R. Eyre, Johnstown, Pa.

616,436 Electric welding; H. F. A. Kleinschmidt, Johnstown, Pa.

616,437 Electric welding; H. F. A. Kleinschmidt, Johnstown, Pa.—The method of joining rails and parallel splice-bars, which consists in welding the central portion of the splice-bars to the sides of both rails, and then welding opposite end portions of the splice-bars to the sides of each rail.

ISSUED DECEMBER 27, 1898.

616,507 Incandescent electric lamp socket and base; C. Van Deventer, New York, N. Y.

616,554 Razor; J. F. O'Rourke, New York, N. Y.—A razor blade, a frame to support the same with freedom for longitudinal reciprocation, a pair of electromagnets, a pivoted arm carrying the armatures of said magnets, a connection between said blade and said arm, and a vibrator to make and break the circuit through said magnets alternately.

616,612 Armored electric cable; E. T. Greenfield, New York, N. Y.—A flexible armored electric cable, consisting of an insulated conductor, having two or more metallic armor-strips spirally wound thereon and curved in opposite directions.

616,620 Electric incandescent lamp; H. F. Joel, London, Eng.—A globe adapted to be blown in thin glass, with resisting strength to external atmospheric pressure, a reflecting surface carried thereby, external to and partially enveloping an enclosed filament, and adapted by its concidal or trumpet-like shape to converge and reflect the rays of said filament in a definite direction, an incandescent filament of several spires of a continuous convolution, lying substantially in a surface, coaxial with and equidistant from said reflecting surface, on all sides of the same, to produce a powerful, concentrated, uniform and directive light, without irregular lines of vivid intensity therein.

616,673 Electric motor and method of controlling same; C. W. Kennedy, Rutledge, Pa.—Consists in starting the motor as a two pole machine, with a set of field-coils in series with each other, and subsequently changing it to a multipolar machine, with all of said field-coils in a parallel, and changing the internal resistance of the armature and maintaining the armature in balance uniformly around its axis.

616,714 Automatic telephone exchange; F. A. Lundquist, Lindsborg, Kas.—Consists of a switchboard, a primary carriage, a secondary carriage carried by said primary carriage and movable thereupon, a series of contact points adapted to be engaged by said secondary carriage, and devices for automatically operating said primary and secondary carriages to move the latter into contact with any desired contact point.

616,718 Telephone gravity switch; C. T. Mason, Sumter, S. C.

616,722 Railway signaling device; F. M. Myers, Windsor, Mo.

616,755 Binding-post for electrical, telephone or telegraphic instruments; J. A. Williams, Cleveland, Ohio—Comprises a plate, a saddle or bearing for the wire, a screw having a head or member overlapping the saddle, and a stop arranged to limit the inward movement of the screw.

616,770 Lighting or extinguishing automatically incandescent electric lamps; C. S. Cole, Bridgeport, Ct.

616,779 Electrical safety-lamp for miners; C. Francke, Berlin, Germany—A casing, a cap mounted to swing thereon, and a switch located adjacent to the cap, the switch and cap having coacting stop-lugs by which to prevent the movement of the switch when the switch is in a certain position.

616,800 Electric heater; J. F. McElroy, Albany, N. Y.—Consists of a supporting helix, and a resistance in the form of a compound helix arranged in continuous contact with each convolution of the supporting helix in such a manner that the spaces between the convolutions of the supporting helix shall register substantially with the spaces between corresponding convolutions of the resistance helix.

616,824 Underground electric railway system; F. H. Chamberlain, Washington, D. C.

616,842 Automatic regulator; H. E. Hunt, Pittsburgh, Pa.

616,852 to 865 Automatic weighing machine; F. H. Richards, Hartford, Ct.

ISSUED JANUARY 3, 1899.

616,872 Electric conductor support; J. M. Anderson, Boston, Mass.

616,879 Electro-mechanical gong; C. E. Beach, Binghamton, N. Y.

616,906 Electric furnace; J. A. Deuther, Boston, Mass.—Two opposite electrodes, a feed mechanism, a regulator operating independently of said feed mechanism and located adjacent to the anode for receiving the material to be treated from said feed mechanism and for supplying the same to the arc, and means for operating the regulator.

616,953 Telephone receiver; J. J. Mulconroy, Philadelphia, Pa.

616,956 Electro-magnetic brake; F. C. Newell, Chicago, Ill.

616,978 Storage battery; F. W. Schneider, Triberg, Germany.

616,979 Means for cooling dynamo-electric machines; G. W. Von Siemens & W. H. Roth, Berlin, Germany—Consists of casings conforming approximately to the profile of the field-magnet windings and armature, but separated therefrom, whereby narrow air passages are provided in said machine and means for effecting the rapid flow of air currents through said passages.

616,983 Traveling test apparatus; Edgar Speiden, Jr., Washington, D. C.—Consists of a way, a traveling test apparatus mounted on the way, comprising a carrier, and a keyboard supporting the test devices.

617,002 Means for producing battery-electrodes; T. A. Willard, Norwalk, Ohio—A cutter for producing leafed-battery plates having a cutting edge, inclined downward from front to rear, and a bearing surface on its bottom inclined laterally and an inclined top surface.

617,003 Tubular electrode for storage batteries; T. A. Willard, Norwalk, Ohio—An electrode circular in cross-section, hollow through the center, and having a series of annular ledges from top to bottom, uniform in cross-section from edge to base, and having uniform spaces between them, and curved outward and upward from their base.

617,004 Storage battery electrode; T. A. Willard, Norwalk, Ohio—Has a succession of shelves or projections about its outside and a hollow body hermetically sealed at both ends.

617,010 Timing apparatus for trolley railway systems; H. Garrett, Dallas, Tex.—Consists of the ordinary time mechanism, a continuously active oscillatory indicating pointer, having an operative connection with said time mechanism, and normally moved thereby in one direction, an indicating dial arranged within the plane of movement of the pointer electrically controlled, means for returning the pointer to its initial position, and a normally open bell or alarm circuit, automatically closed by an abnormal movement of said pointer.

617,024 Electrolytic reducing and amalgamating sluice; J. H. Jory, San Francisco, Cal.

617,067 Helix for electrical apparatus; J. T. Williams, New York, N. Y.—Consists of a coil or helix and a second open-circuited coil or helix wound in inductive relation thereto, for the purpose of suppressing the impedance of self-induction therein.

617,699 Electro-magnetic apparatus for actuating mechanism; S. H. Hoggson, Chicago, Ill.

617,114 Electric motor; C. R. Meston, St. Louis, Mo.—Consists of a suspending tube, a plate secured to said tube, a frame plate secured to the plate but insulated therefrom, a field magnet core supported by the frame, a fixed shaft depending from the frame, an armature mounted on said fixed shaft, and fan blades secured to said armature.

617,121 Apparatus for electric current supply; E. J. Preston, London, Eng.

617,128 Electric elevator; A. B. See, New York, N. Y.—Consists of hoisting machinery, a driving motor for operating the latter, controlling electric circuits extending to the car and the several floors, including switches at these points, and a circuit-breaker actuated directly by the car-switch for breaking the floor-switch circuit and for disabling the latter when a car-switch is in use.

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Kindred.... ...Interests

The W. S. Hill Electric Company are erecting a large and commodious factory for the manufacture of switches and the "Hill" specialties. The building will be of four stories, well located, at the corner of Elm and Water streets, New Bedford, Mass., and will be modern in every way.

The Electric Appliance Company, Chicago, have ready for distribution a complete catalogue of the Whitney electrical instruments. The Whitney instruments are too well known to require any particular comment, and this catalogue should be in the hands of every buyer of test instruments.

The Central Electric Company, Chicago, report largely increased sales in the line of transformers, enclosed arc lamps, high-grade knife-switches and switchboards; they enjoy unexcelled facilities in the manufacture of the latter, and have recently furnished some very large and elaborate boards. Their new catalogue, just published, lists a line of special tablet and cutout boards that have not appeared in any other publication.

The Bibber-White Company, of Boston, have sent to the ELECTRICAL REVIEW an unusually attractive and serviceable advertising novelty. It consists of a leather calendar case, arranged to stand upright on a desk, with a space for monthly calendar cards. On the right of the calendar is a little spirit thermometer. The case carries a neat card announcing that the Bibber-White Company are manufacturers and jobbers of electrical merchandise—everything electrical.

Frank B. Cook, of the Sterling Electric Company, Chicago, is being congratulated by his friends upon a recent decision of the Patent Office covering one of his inventions. Early in 1897 Mr. Cook brought an interference suit against a patent covering strong current protectors, issued to Frank R McBerty, and assigned by him to the Western Electric Company. A decision is now rendered by the Patent Office in Mr. Cook's favor. The protector in issue is the protector manufactured by the Sterling Electric Company for the independent telephone field.

The Sprague Electric Company, of New York city, has issued from the press of Bartlett & Company a beautifully prepared catalogue, No. 58, telling of the advantages of the Lundell motor as a source of electric power. In every sense this catalogue is a thoroughly artistic, and at the same time practical, booklet of information for the intending purchaser. The illustrations are profuse, and the accompanying text is clear and convincing. The catalogue contains a large number of illustrations, showing the various uses to which the Lundell motors may be profitably put.

The Western Electrical Supply Company, of St. Louis, Mo., have recently arranged with the manufacturers of the Espersen adjustable shade lamps to carry these goods in stock. These lamps, which are adjustable to any incandescent circuits, are made in over 20 different styles for desk, standard and wall use. The company are agents in the West for the Eddy Electric Manufacturing Company, the Warren Electric Manufacturing Company, John A. Roebling's Sons Company, Indiana Rubber Insulating Company and the Adams-Bagnall Electric Company. They carry in stock at all times complete lines of standard products made by these several companies, and because of their western location are in a position to make quick delivery of goods to all western buyers.

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